Metallurgist's Handbook

METALLURGIST'S HANDBOOK

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Metallurgist's Handbook

by
Anonymous

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TRANSLITERATION OF THE RUSSIAN ALPHABET

Russian	Transliteration	Russian	Transliteration
А а	a	П п	p
Б б	b	Р р	r
В в	v	С с	s
Г г	g	Т т	t
Д д	d	У у	u
Е е	e	Ф ф	f
Ж ж	zh	Х х	kh
З з	z	Ц ц	ts
И и	i	Ч ч	ch
Й й	y	Ш ш	sh
К к	k	Щ щ	shch
Л л	l	Ы ы	y
М м	m	Э э	e
Н н	n	Ю ю	yu
О о	o	Я я	ya

Translated from the Russian

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SQUARES, CUBES, ROOTS, LOGARITHMS, πn, $\frac{1}{4}\pi n^2$, RECIPROCALS

n	n^2	n^3	$\sqrt{n}$	$\sqrt[3]{n}$	$\log n$	πn	$\frac{1}{4}\pi n^2$	$\frac{1}{n}$
1	1	1	1.000	1.000	0.000	3.142	0.785	1.000
2	4	8	1.414	1.260	0.301	6.283	3.142	0.500
3	9	27	1.732	1.442	0.477	9.425	7.069	0.333
4	16	64	2.000	1.587	0.602	12.57	12.57	0.250
5	25	125	2.236	1.710	0.699	15.71	19.63	0.200
6	36	216	2.449	1.817	0.778	18.85	28.27	0.167
7	49	343	2.646	1.913	0.845	21.99	38.48	0.143
8	64	512	2.828	2.000	0.903	25.13	50.27	0.125
9	81	729	3.000	2.080	0.954	28.27	63.62	0.111
10	100	1 000	3.162	2.154	1.000	31.42	78.54	0.100
11	121	1 331	3.317	2.224	1.041	34.56	95.03	0.091
12	144	1 728	3.464	2.289	1.079	37.70	113.1	0.083
13	169	2 197	3.606	2.351	1.114	40.84	132.7	0.077
14	196	2 744	3.742	2.410	1.146	43.98	153.9	0.071
15	225	3 375	3.873	2.466	1.176	47.12	176.7	0.067
16	256	4 096	4.000	2.520	1.204	50.27	201.1	0.062
17	289	4 913	4.123	2.571	1.230	53.41	227.0	0.059
18	324	5 832	4.243	2.668	1.255	56.55	254.5	0.056
19	361	6 859	4.359	2.669	1.279	59.69	283.5	0.053
20	400	8 000	4.472	2.714	1.301	62.83	314.2	0.050
21	441	9 261	4.583	2.759	1.322	65.97	346.4	0.048
22	484	10 648	4.690	2.802	1.342	69.12	380.1	0.045
23	529	12 167	4.796	2.844	1.362	72.26	415.5	0.043
24	576	13 824	4.899	2.884	1.380	75.40	452.4	0.042
25	625	15 625	5.000	2.924	1.398	78.54	490.9	0.040
26	676	17 576	5.099	2.962	1.415	81.68	530.9	0.038
27	729	19 683	5.196	3.000	1.431	84.82	572.6	0.037
28	784	21 952	5.292	3.037	1.447	87.97	615.8	0.036
29	841	24 389	5.385	3.072	1.462	91.11	660.5	0.034
30	900	27 000	5.477	3.107	1.477	94.25	706.9	0.033
31	961	29 791	5.568	3.141	1.491	97.39	754.8	0.032
32	1 024	32 768	5.657	3.175	1.505	100.5	804.2	0.031
33	1 089	35 937	5.745	3.208	1.519	103.7	855.3	0.030
34	1 156	39 304	5.831	3.240	1.531	106.8	907.9	0.029
35	1 225	42 875	5.916	3.271	1.544	110.0	962.1	0.029
36	1 296	46 656	6.000	3.302	1.556	113.1	1018	0.028

Continued

n	n^2	n^3	$\sqrt{n}$	$\sqrt[3]{n}$	$\log n$	πn	$\frac{1}{4}\pi n^2$	$\frac{1}{n}$
37	1 369	50 653	6.083	3.332	1.568	116.2	1075	0.027
38	1 444	54 872	6.164	3.362	1.580	119.4	1134	0.026
39	1 521	59 319	6.245	3.391	1.591	122.5	1195	0.026
40	1 600	64 000	6.325	3.420	1.602	125.7	1257	0.025
41	1 681	68 921	6.403	3.448	1.613	128.8	1320	0.024
42	1 764	74 088	6.481	3.476	1.623	131.9	1385	0.024
43	1 849	79 507	6.557	3.503	1.633	135.1	1452	0.023
44	1 936	85 184	6.633	3.530	1.643	138.2	1521	0.023
45	2 025	91 125	6.708	3.557	1.653	141.4	1590	0.022
46	2 116	97 336	6.782	3.583	1.663	144.5	1662	0.022
47	2 209	103 823	6.856	3.609	1.672	147.7	1735	0.021
48	2 304	110 592	6.928	3.634	1.681	150.8	1810	0.021
49	2 401	117 649	7.000	3.659	1.690	153.9	1886	0.020
50	2 500	125 000	7.071	3.684	1.699	157.1	1963	0.020
51	2 601	132 651	7.141	3.708	1.708	160.2	2043	0.020
52	2 704	140 608	7.211	3.733	1.716	163.4	2124	0.019
53	2 809	148 877	7.280	3.756	1.724	166.5	2206	0.019
54	2 916	157 464	7.348	3.780	1.732	169.7	2290	0.019
55	3 025	166 375	7.416	3.803	1.740	172.8	2376	0.018
56	3 136	175 616	7.483	3.826	1.748	175.9	2463	0.018
57	3 249	185 193	7.550	3.849	1.756	179.1	2552	0.018
58	3 364	195 112	7.616	3.871	1.763	182.2	2642	0.017
59	3 481	205 379	7.681	3.893	1.771	185.4	2734	0.017
60	3 600	216 000	7.746	3.915	1.778	188.5	2827	0.017
61	3 721	226 981	7.810	3.936	1.785	191.6	2922	0.0164
62	3 844	238 328	7.874	3.958	1.792	194.8	3019	0.0161
63	3 969	250 047	7.937	3.979	1.799	197.9	3117	0.0159
64	4 096	262 144	8.000	4.000	1.806	201.1	3217	0.0156
65	4 225	274 625	8.062	4.021	1.813	204.2	3318	0.0154
66	4 356	287 496	8.124	4.041	1.820	207.4	3421	0.0152
67	4 489	300 763	8.185	4.062	1.826	210.5	3526	0.0149
68	4 624	314 432	8.246	4.082	1.833	213.6	3632	0.0147
69	4 761	328 509	8.307	4.102	1.839	216.8	3739	0.0145
70	4 900	343 000	8.367	4.121	1.845	219.9	3848	0.0143
71	5 041	357 911	8.426	4.141	1.851	223.1	3959	0.0141
72	5 184	373 248	8.485	4.160	1.857	226.2	4072	0.0139
73	5 329	389 017	8.544	4.179	1.863	229.3	4185	0.0137
74	5 476	405 224	8.602	4.198	1.869	232.5	4301	0.0135
75	5 625	421 875	8.660	4 217	1.875	235.6	4418	0.0133

Continued

n	n^2	n^3	$\sqrt{n}$	$\sqrt[3]{n}$	$\log n$	πn	$\frac{1}{4}\pi n^2$	$\frac{1}{n}$
76	5 776	438 976	8.718	4.236	1.881	238.8	4536	0.0132
77	5 929	456 533	8.775	4.254	1.886	241.9	4657	0.0130
78	6 084	474 552	8.832	4.273	1.892	245.0	4778	0.0128
79	6 241	493 039	8.888	4.291	1.898	248.2	4902	0.0127
80	6 400	512 000	8.944	4.309	1.903	251.3	5027	0.0125
81	6 561	531 441	9.000	4.327	1.908	254.5	5153	0.0123
82	6 724	551 368	9.055	4.344	1.914	257.6	5281	0.0122
83	6 889	571 787	9.110	4.362	1.919	260.8	5411	0.0120
84	7 056	592 704	9.165	4.380	1.924	263.9	5542	0.0119
85	7 225	614 125	9.220	4.397	1.929	267.0	5675	0.0118
86	7 396	636 056	9.274	4.414	1.940	270.2	5809	0.0116
87	7 569	658 503	9.327	4.431	1.939	273.3	5945	0.0115
88	7 744	681 472	9.381	4.448	1.944	276.5	6082	0.0114
89	7 921	704 969	9.434	4.465	1.949	279.6	6221	0.0112
90	8 100	729 000	9.487	4.481	1.954	282.7	6362	0.0111
91	8 281	753 571	9.539	4.498	1.959	285.9	6504	0.0110
92	8 464	778 688	9.592	4.514	1.964	289.0	6648	0.0109
93	8 649	804 357	9.644	4.531	1.968	292.2	6793	0.0108
94	8 836	830 584	9.695	4.547	1.973	295.3	6940	0.0106
95	9 025	857 375	9.747	4.563	1.978	298.5	7088	0.0105
96	9 216	884 736	9.798	4.579	1.982	301.6	7238	0.0104
97	9 409	912 673	9.849	4.595	1.987	304.7	7390	0.0103
98	9 604	941 192	9.899	4.610	1.991	307.9	7543	0.0102
99	9 801	970 299	9.950	4.626	1.996	311.0	7698	0.0101
100	10 000	1 000 000	10.00	4.642	2.000	314.2	7854	0.0100
110	12 100	1 331 000	10.49	4.791	2.041	345.6	9503	0.0091
120	14 440	1 728 000	10.95	4.932	2.079	377.0	1310	0.0083
130	16 900	2 197 000	11.40	5.066	2.114	408.4	1327	0.0077
140	19 600	2 744 000	11.83	5.192	2.146	439.8	1539	0.0071
150	22 500	3 375 000	12.25	5.313	2.176	471.2	1767	0.0067
160	25 600	4 096 000	12.65	5.429	2.204	502.7	2011	0.0062
170	28 900	4 913 000	13.04	5.540	2.230	534.1	2270	0.0059
180	32 400	5 832 000	13.42	5.646	2.255	565.5	2545	0.0056
190	36 100	6 859 000	13.78	5.749	2.279	596.9	2835	0.0053
200	40 000	8 000 000	14.14	5.848	2.301	628.3	3142	0.0050
210	44 100	9 261 000	14.49	5.944	2.322	659.7	3464	0.0048
220	48 400	1 065 000	14.83	6.037	2.342	691.2	3801	0.0045
230	52 900	1 217 000	15.17	6.127	2.362	722.6	4155	0.0043
240	57 600	1 382 000	15.49	6.214	2.380	754.0	4524	0.0042

Continued

n	n^2	n^3	$\sqrt{n}$	$\sqrt[3]{n}$	$\log n$	πn	$\frac{1}{4}\pi n^2$	$\frac{1}{n}$
250	62 500	1 562 000	15.81	6.300	2.398	785.4	4909	0.0040
260	67 600	1 758 000	16.12	6.383	2.415	816.8	5309	0.0038
270	72 900	1 968 000	16.43	6.463	2.431	848.2	5726	0.0037
280	78 400	2 195 000	16.73	6.542	2.447	879.6	6158	0.0036
290	84 100	2 439 000	17.03	6.619	2.462	911.1	6605	0.0034
300	90 000	2 700 000	17.32	6.694	2.477	942.5	7069	0.0033
310	96 100	2 979 000	17.61	6.768	2.491	973.9	7548	0.00323
320	102 400	3 277 000	17.89	6.840	2.505	1005	8042	0.00312
330	108 900	3 594 000	18.17	6.910	2.519	1037	8553	0.00303
340	115 600	3 930 000	18.44	6.980	2.531	1068	9079	0.00294
350	12 250	4 287 000	18.71	7.047	2.544	1100	9621	0.00286
360	12 960	4 666 000	18.97	7.114	2.556	1131	1018	0.00278
370	13 690	5 065 000	19.24	7.179	2.568	1162	1075	0.00270
380	14 440	5 487 000	19.49	7.243	2.580	1194	1134	0.00263
390	15 210	5 932 000	19.75	7.306	2.591	1225	1195	0.00256
400	16 000	6 400 000	20.00	7.368	2.602	1257	1257	0.00250
410	16 810	6 892 000	20.95	7.429	2.613	1288	1320	0.00244
420	17 640	7 409 000	20.49	7.489	2.623	1319	1385	0.00238
430	18 490	7 951 000	20.74	7.548	2.633	1351	1452	0.00233
440	19 360	8 518 000	20.98	7.606	2.643	1382	1521	0.00227
450	20 250	9 112 000	21.21	7.663	2.653	1414	1590	0.00222
460	21 160	9 734 000	21.45	7.719	2.663	1445	1662	0.00217
470	22 090	10 382 000	21.68	7.775	2.672	1477	1735	0.00213
480	23 040	11 059 000	21.91	7.830	2.681	1508	1810	0.00208
490	24 010	1 176 000	22.14	7.884	2.690	1539	1886	0.00204
500	25 000	1 250 000	22.36	7.937	2.699	1571	1963	0.00200
510	26 010	1 327 000	22.58	7.990	2.708	1602	2043	0.00196
520	27 040	1 406 000	22.80	8.041	2.716	1634	2120	0.00192
530	28 090	1 489 000	23.02	8.093	2.724	1665	2206	0.00189
540	29 160	1 575 000	23.24	8.143	2.732	1696	2290	0.00185
550	30 250	1 664 000	23.45	8.193	2.740	1728	2376	0.00182
560	31 360	1 756 000	23.66	8.243	2.748	1759	2463	0.00179
570	32 490	1 852 000	23.87	8.291	2.757	1791	2552	0.00175
580	33 640	1 951 000	24.08	8.340	2.763	1822	2642	0.00172
590	34 810	2 054 000	24.29	8.387	2.771	1854	2734	0.00169
600	36 000	2 160 000	24.49	8.434	2.778	1885	2827	0.00167
610	37 210	2 270 000	24.70	8.841	2.785	1916	2922	0.00164
620	38 440	2 383 000	24.90	8.527	2.792	1948	3019	0.00161
630	39 690	2 500 000	25.10	8.573	2.799	1979	3117	0.00159

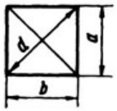
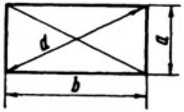
Continued

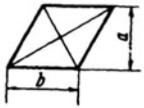
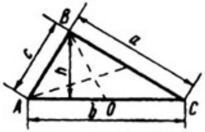
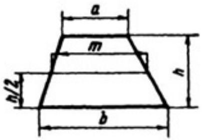
n	n^2	n^3	$\sqrt{n}$	$\sqrt[3]{n}$	$\log n$	πn	$\frac{1}{4}\pi n^2$	$\frac{1}{n}$
640	40 960	2 621 000	25.30	8.618	2.806	2011	3217	0.00156
650	42 250	2 746 000	25.50	8.662	3.813	2042	3318	0.00154
660	43 560	2 875 000	25.69	8.707	2.820	2073	3421	0.00152
670	44 890	3 008 000	25.88	8.750	2.826	2105	3526	0.00149
680	46 240	3 144 000	26.08	8.794	2.833	2136	3632	0.00147
690	47 610	3 285 000	26.27	8.837	2.839	2168	3739	0.00145
700	49 000	3 430 000	26.46	8.879	2.845	2199	3848	0.00143
710	50 410	3 579 000	26.65	8.921	2.851	2231	3959	0.00141
720	51 840	3 732 000	26.83	8.963	2.857	2262	4072	0.00139
730	53 290	3 890 000	27.02	9.004	2.863	2293	4185	0.00137
740	54 760	4 052 000	27.20	9.045	2.869	2325	4301	0.00135
750	56 250	4 219 000	27.39	9.086	2.875	2356	4418	0.00133
760	57 760	4 390 000	27.57	9.126	2.881	2388	4536	0.00132
770	59 290	4 565 000	27.75	9.166	2.886	2419	4657	0.00130
780	60 840	4 746 000	27.93	9.205	2.892	2450	4778	0.00128
790	62 410	4 930 000	28.11	9.244	2.898	2482	4902	0.00127
800	64 000	5 120 000	28.28	9.283	2.903	2513	5027	0.00125
810	65 610	5 314 000	28.46	9.322	2.908	2545	5153	0.00123
820	67 240	5 514 000	28.64	9.360	2.914	2576	5281	0.00122
830	68 890	5 718 000	28.81	9.398	2.919	2608	5411	0.00120
840	70 560	5 927 000	28.98	9.435	2.924	2639	5542	0.00119
850	72 250	6 141 000	29.15	9.473	2.929	2670	5675	0.00118
860	73 960	6 361 000	29.33	9.510	2.934	2702	5809	0.00116
870	75 690	6 585 000	29.50	9.546	2.940	2733	5945	0.00115
880	77 440	6 815 000	29.66	9.583	2.944	2765	6082	0.00114
890	79 210	7 050 000	29.83	9.619	2.949	2796	6221	0.00112
900	81 000	7 290 000	30.00	9.655	2.954	2827	6362	0.00111
910	82 810	7 536 000	30.17	9.691	2.959	2859	6504	0.00110
920	84 640	7 787 000	30.33	9.726	2.964	2890	6648	0.00109
930	86 490	8 044 000	30.50	9.761	2.968	2922	6793	0.00108
940	88 360	8 306 000	30.66	9.796	2.973	2953	6940	0.00106
950	90 250	8 574 000	30.82	9.830	2.978	2985	7088	0.00105
960	92 160	8 847 000	30.98	9.865	2.982	3016	7238	0.00104
970	94 090	9 127 000	31.14	9.899	2.987	3047	7390	0.00103
980	96 040	9 412 000	31.30	9.933	2.991	3079	7543	0.00102
990	98 010	9 703 000	31.46	9.967	2.996	3110	7698	0.00101
1000	100 000	10 000 000	31.62	10.000	3.000	3142	7854	0.00100

AREAS

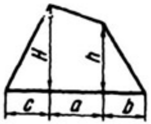
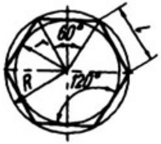
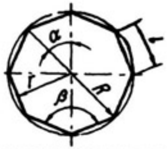
F — area
P — semiperimeter
a, b — sides
d — diagonal
H, h — height
m — median
L — circumference

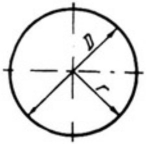
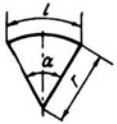
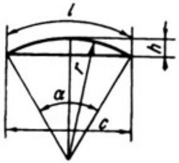
l — length of arc
n — number of sides of polygon
R — radius of circumscribed circle
r — radius of inscribed circle
α — central angle
β — inside angle
D — diameter

Name	Sketch	Formulae
Square		$F=a^2$; $F=\frac{1}{2}d^2$; $a=0.7071\cdot d=\sqrt{F}$; $d=1.414\ a=1.414\sqrt{F}$
Rectangle		$F=a\cdot b=a\sqrt{d^2-a^2}=b\sqrt{d^2-b^2}$; $d=\sqrt{a^2+b^2}$; $a=\sqrt{d^2-b^2}=\frac{F}{b}$; $b=\sqrt{d^2-a^2}=\frac{F}{a}$

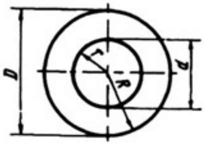
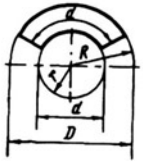
Parallelogram		$F=a\cdot b;\ a=\frac{F}{b};\ b=\frac{F}{a}$
Right-angled triangle		$F=\frac{b\cdot h}{2}=\frac{b}{2}\sqrt{a^2-\left(\frac{a^2+b^2+c^2}{2b}\right)^2};$ $P=\frac{1}{2}(a+b+c)$, then $F=\sqrt{P(P-a)(P-b)(P-c)};\ AO=OC$
Trapezium		$F=\frac{(a+b)h}{2b};\ m=\frac{a+b}{2};\ F=m\cdot h$

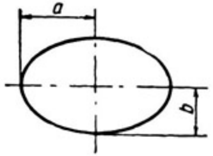
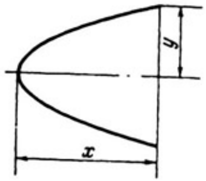
Continued

Name	Sketch	Formulae
Quadrangle		$F=\frac{(H+h)\,a+b\cdot h+c\cdot H}{2}$
Regular hexagon		$F=2.598\ l^2=2.598\ R^2=3.464\ r^2;$ $R=l=1.155;\ r=0.866\ l=0.866R$
Regular polygon		$\alpha=360^\circ:n;\ \beta=180^\circ-\alpha;\ F=\frac{n\cdot l\cdot r}{2}=$ $=\frac{n\cdot l}{2}\sqrt{R^2-\frac{l^2}{4}};\ R=\sqrt{r^2+\frac{l^2}{4}};$ $r=\sqrt{R^2-\frac{l^2}{4}};\ l=2\sqrt{R^2-r^2}$

Circle		$F=\pi\cdot r^2=3.1416r^2=0.7854d^2$; $L=2\cdot\pi\cdot r=6.2832r=3.1416d$; $r=L:6.2832=\sqrt{F:3.1416}=0.564\sqrt{F}$; $D=L:3.1416=\sqrt{F:0.7854}=1.128\sqrt{F}$
Sector		$l=\frac{r\cdot\alpha\cdot3.1416}{180}=0.01745\alpha r$; $l=\frac{2F}{r}$; $F=\frac{1}{2}r\cdot l=0.008727\alpha r^2$; $\alpha=\frac{57.296\cdot l}{r}$; $r=\frac{2F}{l}=\frac{57.296\cdot l}{\alpha}$
Segment		$C=2\sqrt{h(2r-h)}$; $F=\frac{1}{2}[r\cdot l-C(r-h)]$; $r=\frac{C^2+4h^2}{8h}$; $l=0.01745\cdot r\alpha$; $h=r-\frac{1}{2}\sqrt{4r^2-C^2}$; $\alpha=\frac{57.296l}{r}$

Continued

Name	Sketch	Formulae
Annulus		$F=\pi(R^2-r^2)=3.1416(R^2-r^2)=$ $=3.1416(R+r)(R-r)=0.7854(D^2-d^2)=$ $=0.7854(D+d)(D-d)$
Annular sector		$F=\frac{\alpha\cdot\pi}{360}(R^2-r^2)=0.00873\alpha(R^2-r^2)=$ $=\frac{\alpha\cdot\pi}{4\cdot360}(D^2-d^2)=0.00218\alpha(D^2-d^2)$

Ellipse		$F=\pi\cdot a\cdot b=3.1416\cdot a\cdot b$ Approximate value of perimeter $2P=3.1416\sqrt{2\,(a^2+b^2)}$
Parabola		$F=\frac{2}{3}\cdot xy$

ELEMENTS OF CIRCLE SEGMENT

Length of arc, height, chord; area of segment; relation of elements for different central angles of circumference with R = 1

α — central angle
a — length of chord
l — length of arc
h — height
S — area of segment

α degrees	l	h	a	S	$\frac{a}{h}$	$\frac{h}{a}$	$\frac{l}{h}$
5	0.0873	0.0010	0.0872	0.00006	91.6587	0.0109	91.69
10	0.1745	0.0038	0.1743	0.00044	45.8075	0.0218	45.87
15	0.2618	0.0086	0.2611	0.00149	30.5141	0.0328	30.60
20	0.3491	0.0152	0.3473	0.00352	22.8601	0.0437	22.98
25	0.4363	0.0237	0.4329	0.00686	18.2619	0.0548	18.41
30	0.5236	0.0341	0.5176	0.01180	15.1915	0.0658	15.37
35	0.6109	0.0463	0.6014	0.01864	12.9942	0.0770	13.20
40	0.6981	0.0603	0.6840	0.02767	11.3426	0.0882	11.58
45	0.7854	0.0761	0.7654	0.03915	10.0547	0.0995	10.32
50	0.8727	0.0937	0.8452	0.05331	9.0214	0.1109	9.31
55	0.9599	0.1130	0.9235	0.07039	8.1733	0.1224	8.50
60	1.0472	0.1340	1.0000	0.09059	7.4641	0.1340	7.82
65	1.1345	0.1566	1.0746	0.11408	6.8617	0.1457	7.24
70	1.2217	0.1808	1.1472	0.14102	6.3432	0.1577	6.76
75	1.3090	0.2066	1.2175	0.17154	5.8918	0.1697	6 34
80	1.3963	0.2340	1.2856	0, 20573	5.4950	0.1820	5.97

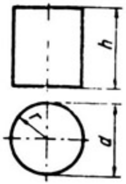
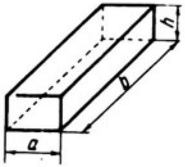
Continued

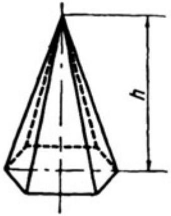
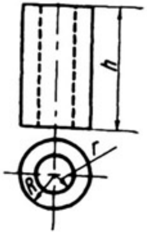
α degrees	l	h	a	S	$\frac{a}{h}$	$\frac{h}{a}$	$\frac{l}{h}$
85	1.4835	0.2627	1.3512	0.24367	5.1430	0.1944	5.65
90	1.5708	0.2929	1.4142	0.28540	4.8284	0.2071	5.36
95	1.6581	0.3244	1.4746	0.33093	4.5454	0.2200	5.11
100	1.7453	0.3572	1.5321	0.38026	4.2890	0.2332	4.89
105	1.8326	0.3912	1.5867	0.43333	4.0556	0.2466	4.68
110	1.9199	0.4264	1.6383	0.49008	3.8420	0.2603	4.50
115	2.0071	0.4627	1.6868	0.55041	3.6455	0.2743	4.34
120	2.0944	0.5000	1.7321	0.61418	3.4641	0.2887	4.19
125	2.1817	0.5383	1.7740	0.68125	3.2960	0.3034	4.05
130	2.2689	0.5774	1.8126	0.75144	3.1394	0.3185	3.93
135	2.3562	0.6173	1.8478	0.82454	2.9932	0.3341	3.82
140	2.4435	0.6580	1.8794	0.90034	2.8563	0.3501	3.71
145	2.5307	0.6993	1.9074	0.97858	2.7277	0.3662	3.62
150	2.6180	0.7412	1.9319	1.05900	2.6065	0.3837	3.53
155	2.7053	0.7836	1.9526	1.14132	2.4920	0.4013	3.45
160	2.7925	0.8264	1.9696	1.22525	2.3835	0.4196	3.38
165	2.8798	0.8695	1.9829	1.31049	2.2806	0.4385	3.31
170	2.9671	0.9128	1.9924	1.39671	2.1826	0.4588	3.25
175	3.0543	0.9564	1.9981	1.48359	2.0892	0.4787	3.19
180	3.1416	1.0000	2.0000	1.57080	2.0000	0.5000	3.14

SURFACES AND VOLUMES OF SOLIDS

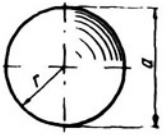
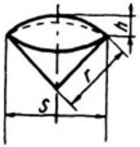
F — full surface
M — lateral surface
V — volume

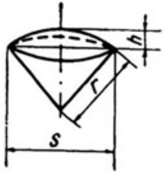
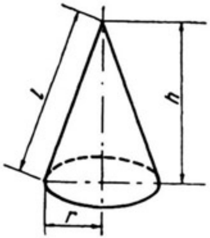
d — diameter
R, r — radius
h — height
a, b — sides

Name	Sketch	Formulae
Cylinder		$M=\pi\cdot d\cdot h=2\pi\cdot r\cdot h;$ $V=\pi\cdot r^2\cdot h=\frac{\pi\cdot d^2}{4}\cdot h;$ $F=2\pi\cdot r\,(r+h)$
Straight prism		$M=2h\,(a+b);\ F=2\,(ah+bh+ab);$ $V=a\cdot b\cdot h$

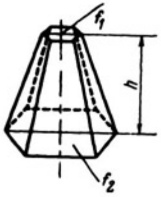
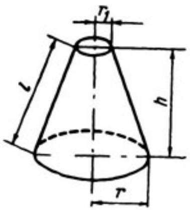
Regular pyramid		F=sum of areas of triangles + area of base; $V=\frac{h}{3}\times$area of base
Hollow cylinder		M=sum of internal and external areas$=2\pi\cdot h\,(R+r)$; $V=\pi\cdot h\,(R^2-r^2)$

Continued

Name	Sketch	Formulae
Sphere		$F=4\pi\cdot r^2=\pi\cdot d^2$; $V=\frac{4}{3}\pi\cdot r^3=\frac{\pi\cdot d^3}{6}=4.19d^3=0.523r^3$
Spherical sector		$F=\frac{\pi\cdot r}{2}(4h+S)$; $V=\frac{2}{3}\pi r^2\cdot h$

Spherical segment		$M=2\pi r\cdot h=\frac{\pi}{4}(S^2+4h^2)$; $V=\pi\cdot h^2\left(r-\frac{h}{3}\right)=\pi\cdot h\left(\frac{S^2}{8}+\frac{h^2}{6}\right)$ S — diameter of base
Cone		$M=\pi\cdot r\cdot l=\pi\cdot r\sqrt{r^2+h^2}$; $V=\frac{h}{3}r^2\cdot\pi$

Continued

Name	Sketch	Formulae
Truncated pyramid		F=sum of trapezoidal areas + upper and lower base; $V=\frac{h}{3}\left(f_2+f_1+\sqrt{f_2\cdot f_1}\right)$, where f_1 — upper base; f_2 — lower base
Truncated cone		$M=\pi\cdot l(r+r_1)$; $V=\frac{\pi\cdot h}{3}(r^2+r^2_1+r\cdot r_1)$

THE 4th AND 5th POWERS

n	n^4	n^5	n	n^4	n^5
1	1	1	26	456 976	11 881 376
2	16	32	27	531 441	14 348 907
3	81	243	28	614 656	17 210 368
4	256	1 024	29	707 281	20 511 149
5	625	3 125	30	810 000	24 300 000
6	1 296	7 776	31	923 521	28 629 151
7	2 401	16 807	32	1 048 576	33 554 432
8	4 096	32 768	33	1 185 921	39 135 393
9	6 561	59 049	34	1 336 336	45 435 424
10	10 000	100 000	35	1 500 625	52 121 875
11	14 641	161 051	36	1 679 616	60 466 176
12	20 736	248 832	37	1 874 161	69 343 957
13	28 561	371 293	38	2 085 136	79 235 168
14	38 416	537 824	39	2 313 441	90 224 199
15	50 625	759 375	40	2 560 000	102 400 000
16	65 536	1 048 576	41	2 825 761	115 856 201
17	83 521	1 419 857	42	3 111 696	130 691 232
18	104 976	1 889 568	43	3 418 801	147 008 443
19	130 321	2 476 099	44	3 748 096	164 916 224
20	160 000	3 200 000	45	4 100 625	184 528 125
21	194 481	4 084 101	46	4 477 456	205 962 976
22	234 256	5 153 632	47	4 879 681	229 345 007
23	279 841	6 436 343	48	5 308 416	254 803 968
24	331 776	7 962 624	49	5 764 801	282 475 249
25	390 625	9 765 625	50	6 250 000	312 500 000

Continued

n	n^4	n^5	n	n^4	n^5
51	6 765 201	345 025 251	76	33 362 176	2 535 525 376
52	7 311 616	380 204 032	77	35 153 041	2 706 784 157
53	7 890 481	418 195 493	78	37 015 056	2 887 174 368
54	8 503 056	459 165 024	79	38 950 081	3 077 056 399
55	9 150 625	503 284 375	80	40 960 000	3 276 800 000
56	9 834 496	550 731 776	81	43 046 721	3 486 784 401
57	10 556 001	601 692 057	82	45 212 176	3 707 398 432
58	11 316 496	656 356 768	83	47 458 321	3 939 040 643
59	12 117 361	714 924 299	84	49 787 136	4 182 119 424
60	12 960 000	777 600 000	85	52 200 625	4 437 053 125
61	13 845 841	844 596 301	86	54 700 816	4 704 270 176
62	14 776 336	916 132 832	87	57 289 761	4 984 209 207
63	15 752 961	992 436 543	88	59 969 536	5 277 319 168
64	16 777 216	1 073 741 824	89	62 742 241	5 584 059 449
65	17 850 625	1 160 290 625	90	65 610 000	5 904 900 000
66	18 974 736	1 252 332 576	91	68 574 961	6 240 321 451
67	20 151 121	1 350 125 107	92	71 639 296	6 590 815 232
68	21 381 376	1 453 933 568	93	74 805 201	6 956 883 693
69	22 667 121	1 564 031 349	94	78 074 896	7 339 040 224
70	24 010 000	1 680 700 000	95	81 450 625	7 737 809 375
71	25 411 681	1 804 229 351	96	84 934 656	8 153 726 976
72	26 873 856	1 934 917 632	97	88 529 281	8 587 340 257
73	28 398 241	2 073 071 593	98	92 236 816	9 039 207 968
74	29 986 576	2 219 006 624	99	96 059 601	9 509 900 499
75	31 640 625	2 373 046 875	100	100 000 000	10 000 000 000

ALGEBRAIC FACTORS

Name of equation	Equation
Square of sum (or difference)	$(a \pm b)^2 = a^2 \pm 2ab + b^2$
Cube of sum (or difference)	$(a \pm b)^3 = a^3 \pm 3a^2b + 3ab^2 \pm b^3$
Square of polynomial	$(a + b + c + \ldots + k + l)^2 = a^2 + b^2 + c^2 + \ldots + k^2 +$ $+ l^2 + 2ab + 2ac + \ldots + 2ak + 2al + 2bc + \ldots 2bk +$ $+ 2bl + \ldots + 2kl)$
Product of sum and difference (difference of squares)	$(a + b)(a - b) = a^2 - b^2$
Sum (or difference) of cubes	$a^3 \pm b^3 = (a \pm b)(a^2 \pm ab + b^2)$
Sum (or difference) of uneven powers	$a^n \pm b^n = (a \pm b)(a^{n-1} \pm a^{n-2}b + a^{n-3}b^2 \pm \ldots \pm$ $\pm ab^{n-2} + b^{n-1})$
Difference of even powers	$a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \ldots +$ $+ ab^{n-2} + b^{n-1})$
Sum raised to the n-th power (Newton's binomial theorem)	$(a + b)^n = a^n + na^{n-1}b + c_n^2 \cdot a^{n-2}b^2 + c_n^3 \cdot a^{n-3}b^3 +$ $+ \ldots + c_n^k \cdot a^{n-k}b^k + \ldots + b^n$*

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* c_n^k — "binomial coefficients" — the number of combinations from n to k.

SOME NUMERICAL CONSTANTS

Magnitude	n	log n	Magnitude	n	log n
π	3.14159	0.49715	$1:2\pi$	0.15916	$\bar{1}.20182$
2π	6.28319	0.79818	$1:3\pi$	0.10610	$\bar{1}.02573$
3π	9.42478	0.97427	$1:4\pi$	0.07958	$\bar{2}.90079$
4π	12.56637	1.09921	π^2	9.86960	0.99430
6π	18.84956	1.27530	$2\pi^2$	19.73921	1.29533
$4\pi:3$	4.18879	0.62209	$\sqrt{\pi}$	1.77245	0.24857
$\pi:2$	1.57080	0.19612			
$\pi:3$	1.04720	0.02003			
$\pi:4$	0.78540	$\bar{1}.89509$	$\sqrt[3]{\pi}$	1.46459	0.16572
$\pi:6$	0.52360	$\bar{1}.71900$	$1:\pi^2$	0.10132	$\bar{1}.00570$
$\pi:180$	0.01745	$\bar{2}.24188$	$1:\sqrt{\pi}$	0.56419	$\bar{1}.75143$
$2:\pi$	0.63662	$\bar{1}.80388$	$\sqrt{2\pi}$	2.50663	0.39909
$180:\pi$	57.29578	1.75812			
$10\,800:\pi$	3437.747	3.53627	$\sqrt{\pi:2}$	1.25331	0.09806
$648\,000:\pi$	206264.81	5.31443	$\sqrt{2:\pi}$	0.79788	$\bar{1}.90194$
			e	2.71828	0.43429
$1:\pi$	0.31831	$\bar{1}.50825$	e^2	7.38906	0.86859

$\sqrt{e}$	1.64872	0.21715
$\sqrt[3]{e}$	1.39561	0.14476
$1:e$	0.36788	$\bar{1}.56571$
$1:e^2$	0.13533	$\bar{1}.13141$
$\sqrt{1:e}$	0.60653	$\bar{1}.78285$
$\sqrt[3]{1:e}$	0.71653	$\bar{1}.85524$
$\log e$	0.43429	$\bar{1}.63778$
$\ln 10$	2.30258	0.36222
$\ln \pi$	1.14473	0.05870
g	9.81	0.99167
g^2	96.2361	1.98334
$\sqrt{g}$	3.13209	0.49583
$\sqrt{2g}$	4.42945	0.64635

$1:g$	0.10194	$\bar{1}.00833$
$1:2g$	0.05097	$\bar{2}.70730$
$\pi\sqrt{g}$	9.83976	0.99298
$\pi\sqrt{2g}$	13.91552	1.14350
2!	2	
3!	6	
4!	24	
5!	120	
6!	720	
7!	5040	
8!	40320	
9!	362880	
10!	3628800	
11!	39916800	
12!	479001600	
C	0.57722	1.76134

UNIT SYMBOLS

Name of unit	Designation	
	Russian	International
Length		
Metre	*м*	m
Kilometre (1,000 m)	*км*	km
Decimetre (0.1 m)	*дм*	dm
Centimetre (0.01 m)	*см*	cm
Millimetre (0.001 m)	*мм*	mm
Micron (1×10^{-6} m)	*мк*	µ
Angstrom (1×10^{-8} m)	Å	Å
Area		
Square centimetre	*см*^{2}	cm^2
Square decimetre	*дм*^{2}	dm^2
Square metre	*м*^{2}	m^2
Hectare (1×10^4 sq. m)	*га*	ha
Volume		
Cubic centimetre	*см*^{3}	cm^3
Cubic decimetre	*дм*^{3}	dm^3
Cubic metre	*м*^{3}	m^3
Normal volume of gas (at 0°C and 760 mm Hg)	*нм*^{3}	nm^3
Capacity		
Litre	*л*	l
Decalitre (10 l)	*дкл*	dkl
Kilolitre (1,000 l)	*кл*	kl
Mass		
Kilogram (mass)	*кг*	kg
Centner (100 kg)	*ц*	q
Ton (1,000 kg)	*т*	t
Gram (0.001 kg)	*г*	g
Milligram (0.001 g)	*мг*	mg
Technical unit of mass	*кг·сек*^{2}*/м*	kg·sec^2/m

Continued

Name of unit	Designation	
	Russian	International
Force		
Newton	н	N
Dyne	дн	dn
Sten (10^8 dn)	сн	sn
Kilogram	кг	kg
Ton	т	t
Time		
Second	сек	sec
Minute (60 sec)	мин	min
Hour (3,600 sec)	час	hr
Power		
Kilowatt (or stenmetre per sec or kilojoule per sec or 102 kgm per sec)	квт	kw
Watt or joule per sec (0.001 kw)	вт	w
Megawatt (1,000 kw)	мгвт	Mw
Hectowatt (100 w)	гвт	hw
Erg per sec	эрг/сек	e/sec
Kilogram-metre per sec	кгм/сек	$\frac{\text{kgm}}{\text{sec}}$
Horsepower (75 kgm/sec)	л. с.	hp
Work (Energy)		
Stenmetre or kilojoule	кдж	kJ
Megajoule (1,000 kJ)	мгдж	MJ
Joule or watt-second (0.001 kJ)	дж	J
Watt-hour (3,600 watts)	(вт-с) (вт-ч)	whr (wsec)
Kilowatt-hour (1,000 wh)	квт-ч	kwhr
Megawatt-hour (1,000 kwh)	мгвт-ч	Mwhr
Kilogram-calorie (large calorie)	ккал	kcal
Megacalorie (1,000 kcal)	мгкал	Mcal
Megakilocalorie (1,000,000 kcal)	мгккал	Mkcal
Calorie (small calorie 0.001 kcal)	кал	cal
Erg (1 dyne·1 cm = 1 g $\mathrm{cm}^2/\mathrm{sec}^2$)	эрг	e

Continued

Name of unit	Designation	
	Russian	International
Pressure		
Kilogram (force) per sq. cm or technical atmosphere	кг/см² или *ат*	kg cm² or at
Metre of water (0.1 kg/cm²)	м вод. ст.	m H_2O
Millimetre of water (0.001 m H_2O)	мм вод. ст.	mm H_2O
Millimetre of mercury	мм рт. ст.	mm Hg
Thermal units		
Degree of international centigrade scale	°C или *град*	°C or degC
Degree of absolute scale (°K = 273 + °C)	°K или *град*	°K or degK
Specific heat	*ккал/кг* °C	$\frac{\text{kcal}}{\text{kg}\cdot{}^\circ\text{C}}$
Coefficient of heat conductivity	*ккал/м час* °C	$\frac{\text{kcal}}{\text{mhr}\cdot{}^\circ\text{C}}$
Coefficient of heat transfer	*ккал/м² час* °C	$\frac{\text{kcal}}{\text{m}^2\text{hr}\cdot{}^\circ\text{C}}$
Coefficient of temperature conductivity	*м²/час*	$\frac{\text{m}^2}{\text{hr}}$

FACTORS FOR CONVERTING ENGLISH AND AMERICAN MEASURES TO METRIC UNITS

Measures	Designation	Metric unit	n	$1/n$
American				
Barrel (liquid)	bbl	l	119.2	0.0084
Barrel (petroleum)	bbl	l	158.28	0.0063
Barrel (petroleum)	bbl	kg	136.0	0.0073
Bushel (dry)	bu	l	35.21	0.2642
Gallon	gal	l	3.785	
Quart (dry)	qt	l	1.101	
Quart (liquid)	qt	l	0.94625	
Pint (dry)	pt	l	0.5506	
Pint (liquid)	pt	l	0.473125	
English				
Bushel (dry)	bu	l	36.365	
Gallon (liquid)	gal	l	4.546	0.22
Gallons per minute	gal/min	m^3/min	0.273	3.67
Grains per gallon	gr/gal	g/m^3	14.3	0.07
Ton, long	l. t. (2,240 lbs)	t	1.016	0.984
Ton, short	s. t. (2,000 lbs)	t	0.907	1.125
Pounds per gallon	lb/gal	kg/m^3	100	0.01
Quart	qt	l	1.1365	
Pint	pt	l	0.5682	
British thermal unit	BTU	kcal	0.252	3.97
British thermal unit per sq. foot per hour per deg. Fahr.	BTU/sq. ft hr °F	kcal/m^2 hr °C	4.88	0.205
Thermal unit per cu. foot	BTU/cu. ft	kcal/m^3	8.90	0.113
Thermal unit per pound	BTU/lb	kcal/kg	0.555	1.8
Thermal unit per foot, hour, degree Fahr.	BTU/ft hr °F	kcal/m hr °C	1.49	0.671

Measures	Designation	Metric unit	*n*	1/*n*
Common measures				
Statute mile	—	km	1.609	0.62
Nautical mile	—	km	1.853	0.54
Degree (60 nautical miles)	—	km	111.18	0.009
Grain	gr	g	0.0648	15.43
Grains per cubic foot	gr/cu. ft	g/m^3	2.29	0.436
Inch	in.	mm	25.4	0.0394
Square inch	sq. in.	cm^2	6.45	0.155
Cubic inch	cu. in.	cm^3	16.4	0.061
Foot	ft	m	0.305	3.28
Square foot	sq. ft	m^2	0.0929	10.76
Cubic foot	cu. ft	m^3	0.0283	35.32
Cubic feet per minute	cu. ft/min	m^3/hr	1.699	0.587
Cubic feet per pound	cu. ft/lb	m^3/kg	0.0625	16.0
Cubic yard	cu. yd	m^3	0.765	1.308
Tons per square inch	ton/sq. in.	kg/mm^2	1.575	0.636
Ounce	oz	g	28.35	0.0353
Ounces per cubic foot	oz/cu. ft	kg/m^3	1.0	1.0
Pound	lb	kg	0.4536	2.205
Pound per square inch	psi or lb/sq. in.	kg/cm^2	0.0703	14.22
Pound per square foot	lb/sq. ft	kg/m^2	4.88	0.205
Pound per cubic foot	lb/cu ft	kg/m^3	16.0	0.062
Pound per horsepower	lb/hp	kg/hp	0.448	2.23
Pound per foot	lb/ft	kg/m	1.49	0.67
Foot-pound	lb-ft	kgm	0.138	7.23
Hundredweight	cwt	kg	50.8	0.0197
Yard	yd	m	0.914	1.094

CONVERSION OF ENGLISH-AMERICAN MEASURES TO METRIC UNITS

English name	Anglo-American measures	Metric units
	Length	
1 mile (statute)	1,760 yards or 5,280 feet	1,609 m
1 mile (nautical)	6,080 feet	1,852.2 m
1 yard	3 feet or 36 inches	91.44 cm
1 foot	12 inches	304.8 mm
1 inch	0.0833 foot	25.4 mm or 2.54 cm
	Area	
1 square mile	640 acres	258.989 ha or 2.59 km^2
1 acre	4,840 sq. yards or 43,560 sq. feet	4,047 m^2
1 square yard	9 sq. feet or 1,296 sq. inches	0.836 m^2 or 8,360 cm^2
1 square foot	144 sq. inches	0.0929 m^2
1 square inch	—	6.4516 cm^2 or 645.16 mm^2
	Volume	
1 cubic yard	27 cu feet	0.7654 m^3
1 cubic foot	0.03704 cu. yard or 1,728 cu. inches	0.0283 m^3 28.317l
1 cubic inch	—	16.387 cm^3
1 cord	128 cu. feet	3.64 m^3
	Dry measures	
1 Winchester bushel	32 quarts or 64 pints	35.24l
1 U. S. quart	0.96946 British quart or 2 U. S. pints	1.101l
1 U. S. pint	0.96946 British pint	0.5506l

Continued

English name	Anglo-American measures	Metric units
1 Imperial bushel	1.0315 U. S. bushels or 1.2837 cubic feet or 32 British quarts or 2,218.2 cubic inches	36.365 l
1 Imperial quart	1.0315 U. S. quarts or 2 British pints	1.1365 l
1 Imperial pint	1.0315 U. S. pints	0.5682 l
	Liquid measures	
1 U. S. gallon	0.8331 British gallon or 128 fluid ounces or 4 U. S. quarts 8 U. S. pints or	3.785 l
1 U. S. quart	0.8331 British quart 2 U. S. pints or 32 U. S. fluid ounces or	0.94625 l
1 U. S. pint	0.8331 British pint 16 U. S. fluid ounces or 1.2118 British fluid ounces	0.473125 l
1 British gallon Imperial	4 British quarts or 8 British pints or 160 British fluid ounces or 277.41 cubic inches	4.546 l
1 British quart Imperial	1.2003 U. S. quarts or 40 British fluid ounces or 2 British pints	1.1365 l
1 British pint	1.2003 U. S. pints or 20 British fluid ounces	0.5682 l
1 British fluid ounce	0.8252 U. S. fluid ounce	8.41 cm^3

Continued

English name	Anglo-American measures	Metric units
	Weight	
Long ton	2,240 pounds	1,016 kg
Short ton	2,000 pounds	0,907 kg
1 hundredweight	112 pounds	50.8 kg
1 pound avoirdupois	16 ounces 256 drams 7,000 grains	453.6 g
1 ounce avoirdupois	16 drams	28.35 kg
1 dram avoirdupois	27.34 grains	1.772 g
1 grain avoirdupois	—	64.8 mg
1 pound troy	12 ounces 0.82286 pound avoirdupois	373.27 g
1 ounce troy	480 grains 8 drams	31.106 g
1 grain troy	—	64.8 mg

CONVERSION OF ENGLISH-AMERICAN TECHNICAL MEASURES TO METRIC UNITS

LENGTH

Conversion of Inches and Fractions of Inches to Millimetres

1 inch (in) = 25.399 mm; 1 mm = 0.03937 inch

Inches	mm	Inches	mm
1/64	0.397	2	50.8
1/32	0.794	3	76.2
3/64	1.191	4	101.6
1/16	1.587	5	127.0
5/64	1.984	6	152.4
3/32	2.381	7	177.8
1/8	3.175	8	203.2
3/16	4.762	9	228.6
1/4	6.350	10	254.0
5/16	7.937	11	279.4
3/8	9.525	12	304.8
7/16	11.112	13	330.2
1/2	12.700	14	355.6
9/16	14.287	15	381.0
5/8	15.875	16	406.4
11/16	17.462	17	431.8
3/4	19.050	18	457.2
13/16	20.637	19	482.6
7/8	22.225	20	508.0
15/16	23.812	21	533.4
1	25.4	22	558.8

Continued

Inches	mm	Inches	mm
23	584.2	49	1244.6
24	609.6	50	1270.0
25	635.0	51	1295.4
26	660.4	52	1320.8
27	685.8	53	1346.2
28	711.2	54	1371.6
29	736.6	55	1397.0
30	762.0	56	1422.4
31	787.4	57	1447.8
32	812.8	58	1473.2
33	838.2	59	1498.6
34	863.6	60	1524.0
35	889.0	61	1549.4
36	914.4	62	1574.8
37	939.8	63	1600.2
38	965.2	64	1625.6
39	990.6	65	1651.0
40	1016.0	66	1676.4
41	1041.4	67	1701.8
42	1066.8	68	1727.2
43	1092.2	69	1752.6
44	1117.6	70	1778.0
45	1143.0	71	1803.4
46	1168.4	72	1828.8
47	1193.8	73	1854.2
48	1219.2	74	1879.6

Continued

Inches	mm	Inches	mm
75	1905.0	88	2235.2
76	1930.4	89	2260.6
77	1955.8	90	2286.0
78	1981.2	91	2311.4
79	2006.6	92	2336.8
80	2032.0	93	2362.2
81	2057.4	94	2387 6
82	2082.8	95	2413.0
83	2108.2	96	2438.4
84	2133.6	97	2463.8
85	2159.0	98	2489.2
86	2184.4	99	2514.6
87	2209.8	100	2540.0

Conversion of Feet (British) to Metres from 1 to 100

1 foot = 0.3048 m; 1 m = 3.2808 feet

Feet	m	Feet	m	Feet	m	Feet	m
1	0.305	26	7.92	51	15.54	76	23.16
2	0.610	27	8.23	52	15.85	77	23.47
3	0.914	28	8.53	53	16.15	78	23.77
4	1.219	29	8.84	54	16.46	79	24.08
5	1.524	30	9.14	55	16.76	80	24.38
6	1.829	31	9.45	56	17.07	81	24.69
7	2.133	32	9.75	57	17.37	82	24.99
8	2.438	33	10.06	58	17.68	83	25.30
9	2.743	34	10.36	59	17.98	84	25.60
10	3.048	35	10.67	60	18.29	85	25.91
11	3.352	36	10.97	61	18.59	86	26.21
12	3.657	37	11.28	62	18.90	87	26.52
13	3.96	38	11.58	63	19.20	88	26.82
14	4.27	39	11.89	64	19.51	89	27.13
15	4.57	40	12.19	65	19.81	90	27.43
16	4.88	41	12.50	66	20.12	91	27.74
17	5.18	42	12.80	67	20.42	92	28.04
18	5.49	43	13.11	68	20.73	93	28.35
19	5.79	44	13.41	69	21.03	94	28.65
20	6.10	45	13.72	70	21.34	95	28.96
21	6.40	46	14.02	71	21.64	96	29.26
22	6.71	47	14.33	72	21.95	97	29.57
23	7.01	48	14.63	73	22.25	98	29.87
24	7.32	49	14.94	74	22.56	99	30.18
25	7.62	50	15.24	75	22.86	100	30.48

1 mil = 0.001 inch = 0.0254 mm; 1 yard = 0.9144 m; 1 m = = 1.0936 yards; 1 nautical sazhen = 2 yards; 1 statute mile (British) = 1.6093 km; 1 km = 0.6214 statute mile; 1 nautical mile= = 1.85315 km; 1 km = 0.5396 nautical mile. Cutting speed is frequently abbreviated to sfpm (surface feet per minute)

WEIGHTS (COMMERCIAL)

Conversion of British Pounds to Kilograms from 1 to 100

1 pound (lb) = 0.45359 kg; 1 kg = 2.20462 pounds (lbs)

lbs	kg	lbs	kg	lbs	kg	lbs	kg
1	0.454	26	11.793	51	23.133	76	34.473
2	0.907	27	12.247	52	23.587	77	34.926
3	1.361	28	12.701	53	24.040	78	35.380
4	1.814	29	13.154	54	24.494	79	35.834
5	2.268	30	13.608	55	24.947	80	36.287
6	2.722	31	14.061	56	25.401	81	36.741
7	3.175	32	14.515	57	25.855	82	37.194
8	3.629	33	14.968	58	26.308	83	37.648
9	4.082	34	15.422	59	26.762	84	38.102
10	4.536	35	15.876	60	27.215	85	38.555
11	4.989	36	16.329	61	27.669	86	39.009
12	5.443	37	16.783	62	28.123	87	39.462
13	5.897	38	17.236	63	28.576	88	39.916
14	6.350	39	17.690	64	29.030	89	40.370
15	6.804	40	18.144	65	29.483	90	40.823
16	7.257	41	18.597	66	29.937	91	41.277
17	7.711	42	19.051	67	30.391	92	41.730
18	8.165	43	19.504	68	30.844	93	42.184
19	8.618	44	19.958	69	31.298	94	42.637
20	9.072	45	20.412	70	31.751	95	43.091
21	9.525	46	20.865	71	32.205	96	43.545
22	9.979	47	21.319	72	32.658	97	43.998
23	10.433	48	21.772	73	33.112	98	44.452
24	10.886	49	22.226	74	33.566	99	44.905
25	11.340	50	22.680	75	34.019	100	45.359

1 grain (avoirdupois) = 59.062 kg
1 ounce (oz) = 29.349 g; 1 g = 0.03527 ounce
1 hundredweight, British (cwt) = 112 pounds = 50.8 kg
1 hundredweight. U. S. = 100 pounds = 45.4 kg
1 long ton = 1.01604 metric tons; 1 metric ton = 0.9842 long ton
1 short (net) ton = 0.9072 metric ton; 1 metric ton = 1.1023 short tons

VOLUME

Conversion of Cubic Inches to Cubic Centimetres from 1 to 100

1 cubic inch = 16.38662 cm³; 1 cm³ = 0.061025 cubic inch

Cubic Inches	cm³	Cubic Inches	cm³	Cubic Inches	cm³	Cubic Inches	cm³
1	16.387	26	426.052	51	835.717	76	1245.382
2	32.773	27	442.438	52	852.103	77	1261.768
3	49.160	28	458.825	53	868.490	78	1278.155
4	65.546	29	475.211	54	884.876	79	1294.541
5	81.933	30	491.598	55	901.263	80	1310.928
6	98.320	31	507.985	56	917.650	81	1327.315
7	114.706	32	524.371	57	934.036	82	1343.701
8	131.093	33	540.758	58	950.423	83	1360.088
9	147.480	34	557.144	59	966.809	84	1376.474
10	163.866	35	573.531	60	983.196	85	1392.861
11	180.252	36	589.918	61	999.583	86	1409.248
12	196.639	37	606.304	62	1015.969	87	1425.634
13	213.026	38	622.691	63	1032.356	88	1442.021
14	229.412	39	639.077	64	1048.742	89	1458.407
15	245.800	40	655.464	65	1065.129	90	1474.794
16	262.186	41	671.851	66	1081.516	91	1491.181
17	278.572	42	688.237	67	1097.902	92	1507.567
18	294.959	43	704.624	68	1114.289	93	1523.954
19	311.345	44	721.010	69	1130.675	94	1540.340
20	327.732	45	737.397	70	1147.062	95	1556.727
21	344.119	46	753.784	71	1163.449	96	1573.114
22	360.505	47	770.170	72	1179.835	97	1589.500
23	376.892	48	786.557	73	1196.222	98	1605.887
24	393.278	49	802.943	74	1212.608	99	1622.273
25	409.665	50	819.330	75	1228.995	100	1638.660

Conversion of Cubic Feet to Cubic Metres from 1 to 100

1 cubic foot = 0.028316 m³; 1 m³ = 35.315 cubic feet

Cubic feet	m³	Cubic feet	m³	Cubic feet	m³	Cubic feet	m³
1	0.028	26	0.736	51	1.444	76	2.152
2	0.057	27	0.765	52	1.472	77	2.180
3	0.085	28	0.793	53	1.501	78	2.209
4	0.113	29	0.821	54	1.529	79	2.237
5	0.142	30	0.849	55	1.557	80	2.265
6	0.170	31	0.878	56	1.586	81	2.294
7	0.198	32	0.906	57	1.614	82	2.322
8	0.227	33	0.934	58	1.642	83	2.350
9	0 255	34	0.963	59	1.671	84	2.379
10	0.283	35	0.991	60	1.699	85	2.407
11	0.311	36	1.019	61	1.727	86	2.435
12	0.340	37	1.048	62	1.756	87	2.463
13	0.453	38	1.076	63	1.784	88	2.492
14	0.396	39	1.104	64	1.812	89	2.520
15	0.425	40	1.133	65	1.841	90	2.548
16	0.453	41	1.161	66	1.869	91	2.577
17	0.481	42	1.189	67	1.897	92	2.605
18	0.510	43	1.218	68	1.925	93	2.633
19	0.538	44	1.246	69	1.954	94	2.662
20	0.566	45	1.274	70	1.982	95	2.690
21	0.595	46	1.303	71	2.010	96	2.718
22	0.623	47	1.331	72	2.039	97	2.747
23	0.651	48	1.359	73	2.067	98	2.775
24	0.680	49	1.387	74	2.095	99	2.803
25	0.708	50	1.416	75	2.124	100	2.832

1 cubic yard = 0.76453 m³; 1 m³ = 1.30786 cubic yards

Capacity — Dry and Liquid

1 pint=0.5679 litre
1 Imperial gallon (British)=4.54358 litres
1 litre=0.22009 Imperial gallon
1 American gallon=3.7852 litres
1 litre=0.2642 American gallon
1 barrel (American, for kerosene)=40 gallons (American) = 1.5141 hectolitres
1 Imperial quarter=290.789 litres
1 litre=0.0034389 Imperial quarter
1 bushel=36.349 litres; 1 litre=0.0275 bushel
1 register ton=2.83161 m^3; 1 m^3=0.35319 register ton

Consumption of Petrol (Gasoline) in "Miles per Gallon"

In Britain and the United States petrol consumption is given as the number of miles that can be driven with one gallon. Since the British and American gallons are not equal, different factors must be used when converting petrol consumption figures into litres per 100 km; in case of British figures, divide the number of miles by 282.35, while in case of American figures, by 235.2. For example, 25 miles per gallon (British)=11.3l/100 km; 25 miles per gallon (American) = 9.4l/100 km.

AREA

Conversion of Square Inches to Square Centimetres from 1 to 100

1 square inch = 6.45137 cm^2; 1 cm^2 = 0.1550 square inch

Square inches	cm^2	Square inches	cm^2	Square inches	cm^2	Square inches	cm^2
1	6.451	26	167.736	51	329.020	76	490.304
2	12.903	27	174.187	52	335.471	77	496.755
3	19.354	28	180.638	53	341.923	78	503.207
4	25.806	29	187.090	54	348.374	79	509.658
5	32.257	30	193.541	55	354.825	80	516.110
6	38.708	31	199.992	56	361.277	81	522.561
7	45.160	32	206.444	57	367.728	82	529.012
8	51.611	33	212.895	58	374.179	83	535.464
9	58.062	34	219.347	59	380.631	84	541.915
10	64.514	35	225.798	60	387.082	85	548.366
11	70.965	36	232.249	61	393.534	86	554.818
12	77.416	37	238.701	62	399.985	87	561.269
13	83.868	38	245.152	63	406.436	88	567.721
14	90.319	39	251.603	64	412.888	89	574.172
15	96.771	40	258.055	65	419.339	90	580.623
16	103.222	41	264.506	66	425.790	91	587.075
17	109.673	42	270.958	67	432.242	92	593.526
18	116.125	43	277.409	68	438.693	93	599.977
19	122.576	44	283.860	69	445.145	94	606.429
20	129.027	45	290.312	70	451.596	95	612.880
21	135.479	46	296.763	71	458.047	96	619.332
22	141.930	47	303.214	72	464.499	97	625.783
23	148.382	48	309.666	73	470.950	98	632.234
24	154.833	49	316.117	74	477.401	99	638.686
25	161.284	50	322.569	75	483 853	100	645.137

Conversion of Square Feet to Square Metres from 1 to 100

1 square foot = 0.0929 m^2; 1 m^2 = 10.7642 square feet

Square feet	m^2	Square feet	m^2	Square feet	m^2	Square feet	m^2
1	0.093	26	2.415	51	4.738	76	7.061
2	0.186	27	2.508	52	4.831	77	7.153
3	0.279	28	2.601	53	4.924	78	7.246
4	0.372	29	2.694	54	5.017	79	7.339
5	0.465	30	2.787	55	5.110	80	7.432
6	0.557	31	2.880	56	5.202	81	7.525
7	0.650	32	2.973	57	5.295	82	7.618
8	0.743	33	3.066	58	5.388	83	7.711
9	0.836	34	3.159	59	5.474	84	7.804
10	0.929	35	3.252	60	5.574	85	7.897
11	1.022	36	3.344	61	5.667	86	7.990
12	1.115	37	3.437	62	5.760	87	8.082
13	1.208	38	3.530	63	5.853	88	8.175
14	1.301	39	3.623	64	5.946	89	8.268
15	1.394	40	3.716	65	6.039	90	8.361
16	1.486	41	3.809	66	6.131	91	8.454
17	1.579	42	3.902	67	6.224	92	8.547
18	1.672	43	3.995	68	6.317	93	8.640
19	1.765	44	4.088	69	6.410	94	8.733
20	1.858	45	4.181	70	6.503	95	8.826
21	1.951	46	4.273	71	6.596	96	8.919
22	2.044	47	4.366	72	6.689	97	9.011
23	2.137	48	4.459	73	6.782	98	9.104
24	2.230	49	4.552	74	6.875	99	9.197
25	2.323	50	4.645	75	6.968	100	9.290

1 square yard=0.8361 m^2; 1 m^2=1.19602 square yards;
1 acre=4046.8 m^2=40.47 ares; 1 are=0.0247 acre;
1 square mile=2.58994 km^2; 1 km^2=0.3861 square mile

WORK

Conversion of Foot-Pounds (ft-lbs) to Kilogram-metres (kgm) from 1 to 100

1 ft-lb=0.138254 kgm; 1 kgm=7.233 ft-lbs

Foot-pounds	kgm	Foot-pounds	kgm	Foot-pounds	kgm	Foot-pounds	kgm
1	0.138	28	3.871	55	7.604	82	11.337
2	0.277	29	4.009	56	7.742	83	11.475
3	0.415	30	4.148	57	7.880	84	11.613
4	0.553	31	4.286	58	8.019	85	11.752
5	0.691	32	4.424	59	8.157	86	11.890
6	0.830	33	4.562	60	8.295	87	12.028
7	0.968	34	4.701	61	8.434	88	12.166
8	1.106	35	4.839	62	8.572	89	12.305
9	1.244	36	4.977	63	8.710	90	12.443
10	1.383	37	5.115	64	8.848	91	12.581
11	1.521	38	5.254	65	8.987	92	12.719
12	1.659	39	5.392	66	9.125	93	12.858
13	1.797	40	5.530	67	9.263	94	12.996
14	1.936	41	5.668	68	9.401	95	13.134
15	2.074	42	5.807	69	9.540	96	13.272
16	2.212	43	5.945	70	9.678	97	13.411
17	2.350	44	6.083	71	9.816	98	13,549
18	2.489	45	6.221	72	9.954	99	13.687
19	2.627	46	6.630	73	10.093	100	13.825
20	2.765	47	6.498	74	10.231	200	27.650
21	2.903	48	6.636	75	10.369	400	55.300
22	3.042	49	6.774	76	10.507	600	82.953
23	3.180	50	6.913	77	10.646	800	110.603
24	3.318	51	7.051	78	10.784	1000	138.254
25	3.456	52	7.189	79	10.922		
26	3.595	53	7.327	80	11.060		
27	3.733	54	7.466	81	11.199		

In order to express impact strength in kgm/cm² multiply the value in ft lb/sq. in. by 0.155 (the form of the specimen must be taken into account).

1 inch-pound=1.1521 kgcm; 1 kgcm=0.86796 inch-pound.

Power: 1 horsepower (hp)=1.0139 metric horsepower;

1 metric horsepower=0.9863 English horsepower (hp).

PRESSURE

Conversion of Pounds per Square Inch to Metric Atmospheres (kg/cm²) from 1 to 500

1 pound per square inch=0.07031 at; 1 at=14.223 lb/sq. inch

lb/sq. inch	at	lb/sq. inch	at	lb/sq. inch	at	lb/sq. inch	at
1	0.070	29	2.039	57	4.008	85	5.976
2	0.141	30	2.109	58	4.078	86	6.047
3	0.211	31	2.180	59	4.148	87	6.117
4	0.281	32	2.250	60	4.219	88	6.187
5	0.352	33	2.320	61	4.289	89	6.258
6	0.422	34	2.390	62	4.359	90	6.328
7	0.492	35	2.461	63	4.430	91	6.398
8	0.562	36	2.531	64	4.500	92	6.469
9	0.633	37	2.601	65	4.570	93	6.539
10	0.703	38	2.672	66	4.640	94	6.609
11	0.773	39	2.742	67	4.711	95	6.679
12	0.844	40	2.812	68	4.781	96	6.750
13	0.914	41	2.883	69	4.851	97	6.820
14	0.984	42	2.953	70	4.922	98	6.890
15	1.055	43	3.023	71	4.992	99	6.961
16	1.125	44	3.094	72	5.062	100	7.031
17	1.195	45	3.164	73	5.133	101	7.10
18	1.266	46	3.234	74	5.203	102	7.17
19	1.336	47	3.305	75	5.273	103	7.24
20	1.406	48	3.375	76	5.344	104	7.31
21	1.477	49	3.445	77	5.414	105	7.38
22	1.547	50	3.516	78	5.484	106	7.45
23	1.617	51	3.586	79	5.554	107	7.52
24	1.687	52	3.656	80	5.625	108	7.59
25	1.758	53	3.726	81	5.695	109	7.66
26	1.828	54	3.797	82	5.765	110	7.73
27	1.898	55	3.867	83	5.836	111	7.80
28	1.969	56	3.937	84	5.906	112	7.87

Continued

lb/sq. inch	at	lb/sq. inch	at	lb/sq inch	at	lb/sq. inch	at
113	7.95	135	9.49	185	13.00	295	20.74
114	8.02	136	9.56	190	13.36	300	21.09
115	8.09	137	9.63	195	13.71	310	21.80
116	8.16	138	9.70	200	14.06	320	22.50
117	8.23	139	9.77	205	14.41	330	23.20
118	8.30	140	9.84	210	14.77	340	23.90
119	8.37	141	9.91	215	15.12	350	24.61
120	8.44	142	9.98	220	15.47	360	25.31
121	8.51	143	10.05	225	15.82	370	26.01
122	8.58	144	10.12	230	16.17	380	26.72
123	8.65	145	10.19	235	16.51	390	27.42
124	8.72	146	10.27	240	16.87	400	28.12
125	8.79	147	10.34	245	17.23	410	28.83
126	8.86	148	10.41	250	17.58	420	29.53
127	8.93	149	10.48	255	17.93	430	30.23
128	9.00	150	10.55	260	18.28	440	30.94
129	9.07	155	10.89	265	18.63	450	31.64
130	9.14	160	11.25	270	18.98	460	32.34
131	9.21	165	11.60	275	19.34	470	33.05
132	9.28	170	11.95	280	19.69	480	33.75
133	9.35	175	12.30	285	20.04	490	34.45
134	9.42	180	12.66	290	20.39	500	35.16

1 metric atmosphere (technical) (at)=0.9678 physical atmosphere (atm)=1 dyne/cm^2=1 microbar

1 atm=1.0333 at

1 inch mercury=0.0345328 at; 1 at=28.958 inch mercury

1 inch water=0.00254 at; 1 at=393.7 inch water

1 foot water=0.03048 at (or 0.0295 atm)

1 at=32.8 feet water

1 bar=10^6 dynes/cm^2; 1 microbar=10^{-6} bar

1 mm mercury=1 torr

1 bar=750.06 torrs

MISCELLANEOUS MEASURES

Weight of zinc coverings:

1 oz/sq. ft = 305.15 g/m^2; 1 g/m^2 = 0.00328 oz/sq. ft
1 oz/sq. yd = 33.906 g/m^2; 1 g/m^2 = 0.0295 oz/sq. yd

Weight of tin coverings of white metal:

1 lb Sn per basis box = 11.2 g/m^2 surface
1 oz Sn per basis box = 0.7 g/m^2 surface

Specific weight:

1 lb/cu. ft = 0.016 kg/dm^3
1 lb/cu. in. = 27.68 kg/dm^3

Special measures:

1 lb/sq. ft = 4.8824 kg/m^2; 1 kg/m^2 = 0.2048 lb/sq. ft
1 lb/short ton = 0.4999 kg/t
1 lb/long ton = 0.4464 kg/t
1 lb/ft = 1.488 kg/m
1 lb/yd = 0.496 kg/m
1 lb/cu. ft = 16.0185 kg/m^3; 1 kg/m^3 = 0.06242 lb/cu. ft
1 grain/cu. ft = 2.086 g/m^3 (e.g., for dust content)
1 grain/gal (Brit.) = 13 mg/l; 1 grain/gal (Amer.) = 15.6 mg/l
1 lb/gal (Amer.) = 0.11984 kg/l

CONVERSION OF FAHRENHEIT TO CENTIGRADE

$F=\frac{9C}{5}+32 \qquad C=\frac{5(F-32)}{9}$

°F	°C	°F	°C	°F	°C	°F	°C
−459.5	−273.16	8	−13.3	170	76.7	440	226.7
−454	−270.0	9	−12.8	180	82.2	450	232.2
−400	−240	10	−12.2	190	87.8	460	237.8
−300	−184	15	−9.4	200	93.3	470	243.3
−200	−129	20	−6.7	210	98.9	480	248.9
−100	−73.3	25	−3.9	212	100.0	490	254.4
−90	−67.8	30	−1.1	220	104.4	500	260.0
−80	−62.2	32	0.0	230	110.0	510	265.6
−70	−56.7	35	+1.7	240	115.6	520	271.1
−60	−51.2	40	+4.4	250	121.1	530	276.7
−50	−45.6	45	7.2	260	126.7	540	282.2
−45	−42.8	50	10.0	270	132.2	550	287.8
−40	−40.0	55	12.8	280	137.8	560	293.3
−35	−37.3	60	15.6	290	143.3	570	298.9
−30	−34.5	65	18.3	300	148.9	580	304.4
−25	−31.7	70	21.1	310	154.4	590	310.0
−20	−28.9	75	23.9	320	160.0	600	315.6
−15	−26.1	80	26.7	330	165.6	610	321.1
−10	−23.4	85	29.4	340	171.1	620	326.7
5	−20.6	90	32.2	350	176.7	630	332.2
0	−17.8	95	35.0	360	182.2	640	337.8
1	−17.2	100	37.8	370	187.8	650	343.3
2	−16.7	110	43.3	380	193.3	660	348.9
3	−16.1	120	48.9	390	198.9	670	354.4
4	−15.6	130	54.4	400	204.4	680	360.0
5	−15.0	140	60.0	410	210.0	690	365.6
6	−14.4	150	65.6	420	215.6	700	371.1
7	−13.9	160	71.1	430	221.1	710	376.7

Continued

°F	°C	°F	°C	°F	°C	°F	°C
720	382.2	1280	693	1920	1049	3400	1871
730	387.8	1300	704	1940	1060	3450	1899
740	393.3	1320	716	1960	1071	3500	1927
750	398.9	1340	727	1980	1082	3550	1954
760	404.4	1360	738	2000	1093	3600	1982
770	410.0	1380	749	2050	1121	3650	2010
780	415.6	1400	760	2100	1149	3700	2038
790	421.1	1420	771	2150	1177	3750	2066
800	426.7	1440	782	2200	1204	3800	2093
820	437.8	1460	793	2250	1232	3850	2121
840	448.9	1480	804	2300	1260	3900	2149
860	460.0	1500	816	2350	1288	3950	2177
880	471.1	1520	827	2400	1316	4000	2204
900	482.2	1540	838	2450	1343	4100	2260
920	493.3	1560	849	2500	1371	4200	2316
940	504.4	1580	860	2550	1399	4300	2371
960	515.6	1600	871	2600	1427	4400	2427
980	526.7	1620	882	2650	1454	4500	2482
1000	537.8	1640	893	2700	1482	4600	2538
1020	548.9	1660	905	2750	1510	4700	2593
1040	560.0	1680	916	2800	1538	4800	2649
1060	571.1	1700	927	2850	1566	4900	2704
1080	582.2	1720	938	2900	1593	5000	2760
1100	593	1740	949	2950	1621	5200	2871
1120	605	1760	960	3000	1649	5400	2982
1140	616	1780	971	3050	1677	5600	3093
1160	627	1800	982	3100	1704	5800	3204
1180	638	1820	993	3150	1732	6000	3315
1200	649	1840	1005	3200	1760	7000	3871
1220	660	1860	1016	3250	1788	8000	4427
1240	671	1880	1027	3300	1815		
1260	682	1900	1038	3350	1843		

PRINCIPAL CONSTANT RELATIONS BETWEEN VARIOUS UNITS

$e=2.718$; $\log e=0.434$; $\log_e N=2.3\log_{10} N$; $\log_{10} N=0.434\log_e N$

$\cos 30°=\frac{\sqrt{3}}{2}$; $\sin 30°=\frac{1}{2}$; $\sin 45°=\cos 45°=\frac{\sqrt{2}}{2}$;

$\cos\varphi=\frac{1}{\sqrt{1+\tan^2\varphi}}$

$\omega=2\pi n/60$; $\sqrt{2}=1.4142$; $\sqrt{3}=1.7321$

1 radian$=180°/\pi=57°47'$

$1°=\pi/180$ radians ≈ 0.017 radian; $\pi=3.14159$

1 kw-hr=860 kcal=367·100 kgm

1 kcal=426.9 kgm=1.162 whr

1 kw-hr=1.36 hp=101.9 kgm/sec

1 hp=0.736 kw=75 kgm/sec

1 mm H_2O=0.0736 mm Hg=1 kg/m^2

1 m H_2O=0.1 kg/cm^2=1 ton/m^2

1 kg/cm^2=10 m H_2O=736 mm Hg (technical atmosphere)

760 mm Hg=10.333 m H_2O=1.033 kg/cm^2 (physical atmosphere)

1 mm Hg=13.596 mm H_2O

Thermal equivalent of work $A=\frac{1}{427}$ kcal/kgm$=0.002342$ kcal/kgm

Mechanical equivalent of heat $\frac{1}{A}=427$ kgm/kcal

Thermal equivalent of horsepower-hour: 1 hp-hr$\approx$632 kcal/hr

Thermal equivalent of kilowatt-hour: 1 kw-hr=860 kcal/hr

ATOMIC WEIGHT (MOLECULAR WEIGHT), MELTING POINT AND BOILING POINT OF ELEMENTS AND VARIOUS SUBSTANCES

Element or substance	Symbol or formula	Atomic weight (molecular weight)	Melting point, °C	Boiling point at 760 mm Hg, °C
Alumina	Al_2O_3	101.94	2046	2700
Aluminium	Al	26.97	660	2100
Aluminium oxide	Al_2O_3	101.94	2046	2700
Antimony	Sb	121.76	630.5	1400
Arsenic	As	74.91	under pressure 817	sublimes 616
Asphalt	—	—	100	—
Barium	Ba	137.36	704	1638
Barium carbonate	$BaCO_3$	197.37	under pressure 1740	—
Barium chloride	$BaCl_2$	208.4	960	1560
Bauxite	—	—	1820	—
Bauxite ore	—	—	1600—1800	—
Beryllium	Be	9.02	1280	2800
Bismuth	Bi	209.0	271.3	1560
Borax	$Na_2B_4O_7 \cdot 10\,H_2O$	—	anhyd. 741	—
Boric acid	H_3BO_3	61.84	decomposes on heating	—
Boron	B	10.82	2300	2550
Boron oxide	B_2O_3	69.64	5800	—
Brass	—	—	approx. 900	—
Bromine	Br	79.92	−7.3	58
Bronze:				
deformed (6—10%)	—	—	950—1000	—
foundry	—	—	880—1040	—
Bronze castings	—	—	approx. 925	—

Continued

Element or substance	Symbol or formula	Atomic weight (molecular weight)	Melting point, °C	Boiling point at 760 mm Hg, °C
Cadmium	Cd	112.41	321	765
Calcium	Ca	40.08	850	1439
Calcium metasilicate	$CaSiO_3$	116.14	1512	—
Calcium oxide	CaO	56.07	2570	2850
Carbon, graphite	C	12.01	sublimes 3540	—
Carborundum	SiC	40.07	2700	—
Cerium	Ce	140.13	600	1400
Chlorine	Cl	35.457	−101	−34.1
Chromite, brick	—	—	2050	—
Chromite, chromium ore	$FeO \cdot Cr_2O_3$	—	2128	—
Chromium	Cr	52.01	≈1900	2327
Cobalt	Co	58.94	≈1495	≈3200
Copper	Cu	63.54	1083	2595
Copper chloride (II)	$CuCl_2$	134.48	630	655
Cristobalite	SiO_2	—	1702	2330
Firebrick	—	—	1580—1800	—
Fluorine	F	19.0	−218	−188.3
Fluorite (fluorspar)	CaF_2	—	1392	2500
German silver	—	—	approx. 1000	—
Glass	—	—	800—1000	—
Gold	Au	197.2	1063	2960
Hydrogen	H	1.008	−262	−252.78
Iodine	I	126.92	113.6	183
Iridium	Ir	193.1	2454	4800
Iron	Fe	55.85	1539	3200
cast steel	—	—	1520—1450	—
pig iron	—	—	1300—1120	—
Iron castings	—	—	1250—1150	—
Iron oxide (III)	Fe_2O_3	159.7	1570	—
Iron oxide (ferrosoferric) (II, III)	Fe_3O_4	231.55	1530	—
Kaolin, calcined	$Al_2O_3 \cdot 2SiO_2$	—	1770	—
Lead	Pb	207.21	327.4	1750

Continued

Element or substance	Symbol or formula	Atomic weight (molecular weight)	Melting point, °C	Boiling point at 760 mm Hg, °C
Lead oxide (II), mono, litharge	PbO	223.21	890	1470
Lithium	Li	6.94	≈185	1372
Lithium chloride	$LiCl$	42.40	624	1382
Magnesite brick	—	—	2000—2200	—
Magnesium	Mg	24.32	≈650	1102
Magnesium oxide	MgO	40.32	2642	2800
Manganese	Mn	54.93	~1245	2150
Mercury	Hg	200.61	−38.83	357
Molybdenum	Mo	95.95	2620	4800
Muscovite, white mica	$H_2KAl_3Si_3O_{12}$	—	1380	—
Nickel	Ni	58.69	1455	3000
Niobium	Nb	92.91	2415	2900
Nitrogen	N	14.008	210	−195.8
Orthoclase (potassium feldspar)	$KAlSi_3O_8$	—	1175—1235	—
Osmium	Os	190.2	2500	5300
Oxygen	O	16.000	−218.7	−182.9
Palladium	Pd	106.7	≈1550	4000
Paraffin wax	—	—	40—70	—
Phosphorus, yellow	P	30.98	44.1	282
Platinum	Pt	195.23	1773.5	4400
Porcelain	—	—	1670—1730	—
Portland cement	—	—	1530—1670	—
Potash	K_2CO_3	138.20	897	—
Potassium	K	39.096	63	776
Potassium carbonate	K_2CO_3	138.2	897	—
Potassium chloride	KCl	74.56	770	1407
Quartz	SiO_2	—	1477	2230
Quick lime	CaO	56.07	2570	2850
Salt, common	$NaCl$	58.45	800	1465
Selenium	Se	78.96	220	685
Silica (polymorphous quartz)	SiO_2	60.06	1477	2230
tridymite	SiO_2	—	1670	2230

Continued

Element or substance	Symbol or formula	Atomic weight (molecular weight)	Melting point, °C	Boiling point at 760 mm Hg, °C
Silicate brick	—	—	1700—1800	—
Silicon	Si	28.06	1414	2600
Silicon carbide	SiC	40.07	2700	—
Sillimanite	$Al_2O_3SiO_2$	—	1816	—
Silver	Ag	107.88	960.5	2170
Silver chloride	AgCl	143.34	455	1554
Sodium	Na	22.997	97.7	890
Sodium carbonate	Na_2CO_3	106.0	850	—
Sodium chloride	NaCl	58.45	800	1465
Sodium metasilicate	Na_2SiO_3	122.05	1027	—
Stearin (technical)	—	—	54—55	—
Strontium	Sr	87.63	757	1364
Sulphur, monoclinic	S	32.06	119	444.6
Tallow	—	—	40—55	—
Tantalum	Ta	180.88	3000	4100
Thorium	Th	232.12	1800	3530
Tin	Sn	118.70	231.9	2300
Tin oxide (IV)	SnO_2	150.7	under pressure 1900	sublimes 1800—1900
Titanium	Ti	47.90	~1800	3000
Titanum oxide, di (IV)	TiO_2	79.90	1775	—
Tungsten	W	183.92	3400	6000
Tungstenoxide, tri (VI)	WO_3	231.92	1473	—
Uranium	U	238.07	1100	—
Vanadium	V	50.95	1726	3200
Water	H_2O	18.02	0	100
Water glass	Na_2SiO_3	122.05	1027	—
Wollastonite	$CaO \cdot SiO_2$	—	1250—1300	—
Zinc	Zn	65.38	419.5	906
Zirconium	Zr	91.22	≈1750	2900
Zirconium oxide	ZrO_2	123.22	2700	4300

Note. In cases where the exact boiling point is not known, the table gives approximate values.

SPECIFIC GRAVITY OF VARIOUS SOLIDS AT 15° C

Substance	Specific gravity, g/cm³	Substance	Specific gravity, g/cm³
Anthracite	1.35—1.7	Lignite, cleaned on shaking screen	0.7
Asphalt	1.0—1.2	Limestone	2.6—2.8
Basalt	2.6—3.3	Magnesite	3.45—3.65
Bog ore	2.6	Magnetite	4.9—5.2
Brick, common	1.4—1.6	Marble	2.6—2.8
Brick masonry	1.5—1.7	Mica	2.6—3.2
Brick, vitrified	1.7—2.0	Peat, dry	0.5
Brown hematite (limonite)	3.4—3.9	Porcelain	2.2—2.5
Charcoal, air dry	0.4	Portland cement	3.0—3.2
Clay	1.8—2.6	Quicklime	0.9—1.3
Clay, damp	1.8—2.3	Sand, damp	1.9—2.1
Coal	1.2—1.5	Sand, dry	1.58—1.65
Coke, dry	1.4	Sandstone	2.2—2.5
Coke, foundry	1.92	Sandstone masonry	2.1
Concrete	1.8—2.5	Schist, clayey	2.7—2.8
Dolomite	2.85—2.95	Siderite (spathic iron)	3.7—3.9
Emery	4.0	Slag, blast furnace	2.6—3.0
Feldspar	2.5—2.6	Slag, cupola	2.8—3.0
Firebrick	1.8—2.2	Slag, open hearth	2.5—3.0
Fluorspar	3.1—3.2	Slag, Thomas	2.6—3.2
Gravel	1.8—1.9	Slaked lime	1.2—1.3
Gypsum	2.3	Talc	2.6—2.8
Hematite	4.9—5.3	Tar	1.1
Kaolin	2.2—2.6	Wax	0.97
Lignite	1.2—1.4		

SPECIFIC GRAVITY OF TECHNICAL ALLOYS OF IRON AND STEEL AND SOLID ALLOYS AT 20° C

Alloy	Specific gravity, g/cm³
Cast iron, white	7.0–7.8
Cast iron, grey	6.7–7.6
Iron castings	7.15–7.25
Ferrosilicon with:	
Si 7.5%	7.35
Si 20%	6.70
Si 46%	4.87
Si 95%	2.32
Spiegel (10% Mn)	7.60
Ferromanganese (80% Mn)	7.50
Steel castings, unhardened with:	
0.2% C	7.85
0.5% C	7.83
1.0% C	7.81
Dynamo sheet, free from scale (with scale, 0.05 lower):	
normal	7.85
highly alloyed (4% Si)	7.55
Chrome steel (3% Cr)	7.70
Chrome steel (18% Cr, stainless, acid resisting)	7.77
Chrome-nickel steel (8% Ni, 18% Cr, stainless, acid resisting)	7.80
Chrome-nickel steel (20% Ni, 25% Cr, scale resisting)	7.90
Nickel steel with minimum expansion (36% Ni)	8.13
Nickel steel with high initial permeability (50% Ni)	8.19

Continued

Alloy	Specific gravity, g/cm^3
Nickel-manganese steel, nonmagnetic (15% Ni, 5% Mn)	8.03
Cobalt steel (15% Co)	7.80
Cobalt steel (35% Co)	8.00
Tungsten steel (6% W)	8.20
Solid alloys:	
Grade S (WC + TiC with 6 to 8% Co)	from 11.2 to 13.3
Grade G (WC with 6 to 15% Co)	from 13.7 to 14.7
Grade H (WC with 7% Co, 1% Nb, Ta + 0.5% VC)	14.4
Grade F (WC + TiC with 6% Co + 0.5 to 1.2% Ni)	from 6.8 to 9.9

SPECIFIC GRAVITY OF SOME MOLTEN METALS AND ALLOYS

Metal or alloy	Temperature, °C	Specific gravity, g/cm^3
Aluminium	700	2.38
Aluminium	1000	2.30
Iron, pure	1550	7.207
Iron, pure	1600	7.158
Iron, pure	1700	7.057
Iron, pure with 0.1% C	1600	7.061
Iron, pure with 0.5% C	1600	6.920
Iron, pure with 1% C	1600	6.844
Iron, pure with 2% C	1600	6.725
Iron, pure with 3.5% C	1600	6.499
Iron, pure with 9.44% Ni	1500	7.178
Iron, pure with 8.5% Mn	1600	7.122
Iron, pure with 13.7% Cr	1600	7.042
Iron with 3.60% Si	1600	6.920
Iron with 1.15% Al	1600	7.032
Gold	1100	17.24
Gold	1300	17.0
Copper	1100	7.92
Copper	1600	7.53
Nickel	1500	7.764
Lead	327	10.645
Lead	731	10.188
Silver	970	9.32
Silver	1302	9.00
Zinc	419	6.92
Tin	232	6.988

SPECIFIC GRAVITY OF SOME ELEMENTS AT ROOM TEMPERATURE (15—20°C)

Element	Specific gravity, g/cm^3
Aluminium	2.70
Antimony	6.68
Arsenic, black (cryst.)	5.72
Beryllium	1.85
Boron	2.00
Cadmium	8.64
Carbon (diamond)	3.51
Carbon (graphite)	2.25
Carbon (soot)	1.75
Cerium	6.80
Chromium	7.20
Cobalt	8.90
Copper	8.92
Gold	19.29
Hydrogen, g/m^3 at 0°C and 760 mm Hg	0.089
Iron	7.87
Lead	11.34
Magnesium	1.74
Manganese	7.40
Mercury, liquid (20°C)	13.546
Molybdenum	10.20
Nickel	8.90
Niobium	8.60
Nitrogen, g/m^3 at 0°C and 760 mm Hg	1.25
Oxygen, g/m^3 at 0°C and 760 mm Hg	1.43
Palladium	11.97
Phosphorus, red	2.20
Phosphorus, yellow	1.82
Platinum	21.50
Silicon	2.40
Silver	10.50
Sulphur, monoclinic	1.96
Sulphur, rhombic	2.07
Tantalum	16.65
Tin, rhombic	5.81
Tin, tetragonal	7.28
Titanium	4.40
Tungsten	19.30
Uranium	18.70
Vanadium	6.07
Zinc	7.13
Zirconium	6.49

TENSILE STRENGTH OF SOME GRADES OF STEEL AND ALLOYS AT INCREASED TEMPERATURES (TESTS AT DIRECT HEATING)

Grade of steel or alloy	Tensile strength, kg/mm²						
	700°	800°	900°	1000°	1100°	1200°	1300°
15	5.6	5.8	4.5	2.8	2.4	1.4	—
У7	8.6	6.1	3.8	3.1	1.9	1.1	—
У12	7.2	6.9	2.8	2.4	1.5	1.3	—
12ХН3А	13.0	8.1	5.2	4.0	2.8	1.6	1.3
18ХНВА	22.9	11.3	6.6	4.9	2.7	1.9	1.5
30ХГСА	9.7	7.4	4.2	3.6	2.2	1.8	—
60СА	16.7	8.1	5.7	3.4	2.6	3.3	0.6
Х12М	14.3	12.5	8.3	4.7	2.5	0.8	—
Р9	19.6	9.2	8.3	5.7	3.3	2.1	—
Р18	22.6	11.4	11.0	6.8	3.2	2.1	—
1Х13	6.6	3.6	2.7	3.7	2.2	1.2	—
Х9С2	14.0	5.2	6.0	4.6	2.3	1.6	—
Х17	8.6	4.1	2.2	2.1	1.4	0.8	0.6
Х28	7.7	2.6	1.9	1.1	0.8	0.8	—
1Х25Ю5	17.7	8.2	4.8	2.0	1.0	0.6	—
1Х18Н9	21.6	12.2	6.9	3.9	3.1	1.6	—
1Х18Н9Т	—	18.5	9.1	5.5	3.8	1.8	—
Х18Н11Б	—	15.1	—	5.4	—	2.0	1.0
Х18Н25С2	33.8	18.0	10.2	6.3	3.1	2.2	—
Х23Н18	27.2	14.1	9.2	5.5	5.2	2.9	1.4
Х13Н4Г9	22.5	14.6	7.1	4.4	2.3	1.4	—
Х14Н14В2М	—	—	14.6	7.2	4.4	2.7	—
Х15Н60	29.2	17.0	10.6	6.0	3.9	2.9	—
Х20Н80	44.5	21.8	9.4	7.3	3.6	2.3	—

METAL CONSUMPTION PER TON OF USABLE OUTPUT KG PER TON

(approximate figures)

Carbon blooms from ingots of rimmed steel	1130—1150
Carbon blooms from ingots of killed steel	1200—1250
Alloy blooms	1240—1280
High alloy blooms	1300—1350
Carbon slabs from ingots of rimmed steel	1170—1220
Carbon slabs from ingots of killed steel	1240—1270
Alloy slabs	1280—1300
High alloy slabs	1300—1500
Medium and light rolled stock	1050—1080
Hot-rolled plate from ingots	1350—1450
Hot-rolled plate from slabs	1250—1350
Hot-rolled sheet from slabs	1040—1100
Cold-rolled sheet from slabs	1080—1140
Hot-rolled sheet from bars	1160—1250
Cold-rolled sheet from strip	1250—1350
Seamless rolled tubes from billets	1150—1200
Welded tubes from strip	1060—1075

Metal Consumption per Ton of Usable Tubes, Wheels and Tyres

Diameter of tubes, mm	Consumption coefficient
up to 650	1.05
up to 500	1.05
430	1.20
270	1.20
160	1.20
100	1.20
up to 100	1.10
Wheels	1.20
Tyres	1.20

Metal Consumption per Ton of Usable Sheets and Plates

Type and thickness, mm	Consumption coefficient
Plates 5—400	1.10
Plates 4—60	1.30
Plates 6—50	1.30
Plates 4—30	1.30
Plates and sheets 1.6—20	1.10
Sheets 0.6—3	1.10
Sheets 0.3—1.5	1.15
Sheets 0.18—0.8	1.20
Sheets 0.2—1.5	1.10

Metal Consumption per Ton of Usable Section and Profile Rolled Stock

Type and cross-section of rolled stock, mm	Consumption coefficient
Blooms 400×400	1.15—1.25
Blooms 250×250	1.17—1.25
Slabs up to 250×1900	1.20—1.30
Billets 55×55	1.04—1.06
Billets 150×150	
Billets 100×150	1.03—1.05
Billets 50×125	1.03—1.05
Rounds 75—330	1.25
Rails 38—75 kg per run. m	1.15—1.20
Beams 200—600	1.15—1.20
Beams, universal	1.25
Round profiles up to 75	1.05
Angle profiles 50×50	1.05
Angle profiles 30×30	1.04
Round profiles up to 25	1.05
Round profiles up to 20	1.04
Wire rods	1.06

Mould Consumption per Ton of Ingots

Type of ingots	Rimmed steel	Killed steel
	kg	
Ingots, over 12 t, sheet	20	25
Ingots, 6—12 t, sheet	18	23
Ingots, over 6 t, section	15	20
Ingots, 3—6 t	15	20
Ingots, 1—3 t	17	21
Ingots, up to 1 t	20	25
Ingots of quality, high-quality and alloy steel, over 2 t	—	25
Ingots of quality, high-quality and alloy steel, up to 2 t	—	30
Ingots of high-quality steel, up to 1 t	—	35

CONVERSION OF USABLE OUTPUT (%)

Explanation: % in whole digits is shown at the top of the show metal consumption per ton of usable output, the unit being 79.85% we find the corresponding figure in the table to be "252", and

%/0.00%	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
0	538	515	492	470	449	429	408	389	370	351	333	316	299	282	266
05	537	514	491	469	448	428	407	388	369	350	332	315	298	281	265
10	536	513	490	468	447	427	406	387	368	349	331	314	297	280	264
15	535	512	489	467	446	426	405	386	367	348	330	313	296	279	263
20	534	511	488	466	445	425	405	386	367	347	330	313	296	279	263
25	533	510	487	465	444	424	404	385	366	346	329	312	295	278	262
30	531	508	486	464	443	423	403	384	365	345	328	311	294	277	261
35	530	507	485	463	442	422	402	383	364	344	327	310	293	276	260
40	529	506	484	462	441	421	401	382	363	343	326	309	292	276	260
45	528	505	483	461	440	420	400	381	362	342	325	308	291	275	259
50	527	504	482	460	439	419	399	380	361	341	324	307	290	274	258
55	526	503	481	459	438	418	398	379	360	340	324	307	290	273	257
60	524	501	480	458	437	417	397	378	359	339	323	306	289	273	257
65	523	500	479	457	436	416	396	377	358	338	322	305	288	272	256
70	522	499	478	456	435	415	395	376	357	337	321	304	287	271	255
75	521	498	476	454	433	413	394	375	356	336	320	303	286	270	254
80	520	497	475	453	432	412	393	374	355	336	319	302	285	269	253
85	519	496	474	452	431	411	392	373	354	335	318	301	284	268	252
90	517	495	473	451	430	410	391	372	353	334	318	301	284	268	252
95	516	494	472	450	429	409	390	371	352	334	317	300	283	267	251

TO METAL CONSUMPTION PER TON

table, and hundreds at the side. The figures in the body of the table dropped for convenience. For example, if the usable output comes to metal consumption per ton will be 1.252.

80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
250	235	219	205	190	176	163	149	136	123	111	099	087	075	064	053	042
249	234	219	204	189	175	162	148	135	122	110	098	086	074	063	052	041
248	233	218	203	188	174	161	147	134	121	109	097	085	073	062	051	040
247	232	217	202	187	173	160	146	133	121	109	097	085	073	062	051	040
247	232	216	202	187	173	160	146	133	120	108	096	084	072	061	050	039
246	231	216	201	186	172	159	145	132	120	108	096	084	072	061	050	039
245	230	215	200	186	172	159	145	132	119	107	095	083	071	060	049	038
244	229	214	199	185	171	158	144	131	119	107	095	083	071	060	049	038
244	229	213	199	184	170	157	143	130	118	106	094	082	070	059	048	037
243	228	213	198	184	170	157	143	130	118	106	094	082	070	059	048	037
242	227	212	197	183	169	156	142	129	117	105	093	081	069	058	047	036
241	226	211	196	182	168	155	141	129	117	105	093	081	069	058	047	036
241	226	210	196	182	168	155	141	128	116	104	092	080	068	057	046	035
240	225	210	195	181	167	154	140	128	116	104	092	080	068	057	046	035
239	224	209	194	180	166	153	139	127	115	103	091	079	067	056	045	034
238	223	208	193	180	166	153	139	127	115	103	091	079	067	056	045	034
237	222	207	192	179	165	152	138	126	114	102	090	078	066	055	044	033
236	221	207	191	178	164	151	138	125	114	102	090	078	066	055	044	033
236	221	206	191	177	163	150	137	125	113	101	089	077	065	054	043	032
235	220	205	190	177	163	150	137	124	112	100	088	076	064	053	042	031

BULK WEIGHT OF 1 CU. M OF CHARGE MATERIALS, KG

Iron ores:	
magnetite	2500—3500
hematite	2000—2800
limonite	1200—2000
Iron-ore agglomerate	1700—2000
Manganese ore	1700—2000
Mill scale	1900—2000
Lime stone	1400—1700
Cupola slag	2000—2200
Open hearth slag	1600—1800
Bessemer slag	1600—1800
Granulated blast furnace slag with 20—30% moisture content	500—700
Crushed steel turnings, small iron and steel scrap	1800—2200
Large scrap, pig iron	2800—3200
Iron scrap, heavy	2500—3100
Iron scrap, medium	1100—2000
Iron scrap, light	300—1000
Iron scrap, tubes	up to 1000
Magnesite, powdered	2100—2160
Dolomite	1680—1740
Quartz	1370—1560
Coke	450—500
Charcoal:	
birch	170—200
pine	120—150
spruce and fir	100—130

LOSS OF DEOXIDIZERS AND ALLOYING ELEMENTS FROM FERROALLOYS AND TAILINGS IN STEEL MAKING

Element	Loss, %							
	In open hearth furnace		In electric furnace					
	Killed steel	Rimmed steel	Content, %	From tailings	From ferro-alloys	Content above, %	From tailings	From ferro-alloys
Ferro-manganese	25–30	approx. 70	5	20	20	5	15	10
Ferrosilicon	15	—	3	100	15	—	—	—
Chromium	15	—	3	10	5	3	5	5
Nickel	3	—	5	3	3	5	5	5
Tungsten	—	—	3	15	10	3	7	7
Vanadium	15	—	1*	15	10	1	12	8
Molybdenum	5	—	1	3	3	1	5	5
Cobalt	—	—	5	3	3	5	5	5
Titanium	50	—	1	100	50	1	100	40
Niobium	—	—	—	—	—	—	30	15

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* For structural and tool steels with vanadium content up to 0.4%, loss of vanadium is assumed to be 100%.

EFFECT OF ALLOYING ELEMENTS ON STEEL PROPERTIES

Element	Grain size	Tendency towards overheating	Hardenability	Annealing, normalizing and hardening temperatures	Hardness and strength	Plasticity	Oxidation resistance at high temperatures	Strength at high temperatures
Ni	Little effect	Little effect	Increases	Lowers	Increases	Somewhat increases	Somewhat increases	Little effect
Cu	Little effect	Little effect	Somewhat increases	Somewhat raises	Increases	Up to 0.5% increases, then decreases	Little effect	Little effect
Al	Up to 0.1% decreases	Considerably decreases	Little effect	Noticeably raises	Increases	At low content increases	Increases	Little effect

Co	Little effect	Little effect	Decreases	Little effect	Slightly increases	Decreases	Somewhat increases	Slightly increases
Si	At low content decreases; at 2% increases	Little effect	Increases	Raises	Increases	Decreases	Increases	Somewhat increases
Mn	Somewhat increases	Somewhat increases	Increases	Lowers	Increases	Up to 1.5% does not decrease in low-carbon steel; decreases in medium- and high-carbon steel	Little effect	Little effect

Continued

Element	Grain size	Tendency towards overheating	Hardenability	Annealing, normalizing and hardening temperatures	Hardness and strength	Plasticity	Oxidation resistance at high temperatures	Strength at high temperatures
Cr	Decreases	Somewhat decreases	Increases	Raises	Increases	Up to 1.5% does not decrease	Increases	Increases
V	Considerably decreases	Noticeably decreases	Greatly increases	Raises	Increases	Increases	Little effect	Little effect
Mo	Decreases	Little effect	Greatly increases	Raises	Increases	Up to 0.6% increases	Little effect	Increases
W	Decreases	Decreases	Increases	Raises	Increases	1% somewhat increases	Little effect	Considerably increases

Nb	Decreases	Decreases	Decreases	Raises	Increases in low-alloy steel	Somewhat increases	Noticeably increases	Increases
Ti	Greatly decreases	Decreases	At low content greatly increases; at high content decreases	Considerably increases	Somewhat increases	Somewhat increases	Slightly increases	Little effect
Fr	Somewhat decreases, makes homogeneous	Decreases	Somewhat increases	Little effect	Little effect	Increases in free-cutting steel, even with sulphur content up to 0.32%; no effect in absence of sulphur	No effect	Little effect
B	Little effect	Little effect	Greatly increases	No effect	Little effect	Somewhat increases	No effect	No effect

PRINCIPAL OPERATIONS IN HEAT TREATMENT

Normalizing—heating steel to a temperature above the transformation range and holding it at this temperature followed by cooling in air. Normalizing improves the microstructure and mechanical properties of steel and diminishes internal stresses.

Annealing—heating steel to a temperature within the transformation range and holding it at this temperature followed by gradual cooling under definite conditions. Annealing lowers hardness, increases toughness, removes internal stresses, improves machinability and eliminates nonuniformity of structure.

Diffusion annealing (homogenizing)—heating steel to a temperature considerably above the transformation range and holding it at this temperature for a considerable length of time followed by slow cooling. Diffusion annealing reduces chemical nonhomogeneity (segregation) and lessens the possibility of flock formation. Diffusion annealing causes a considerable increase in grain size. For that reason castings, ingots and semi-finished products are renormalized or reannealed after diffusion annealing in order to obtain finer grain.

Hardening—heating steel to a temperature within or above the transformation range and holding it at this temperature followed by rapid cooling in water, oil or some other medium. Hardening improves the physical and mechanical properties of steel.

Case-hardening—heating the surface layer of a workpiece followed by rapid cooling of it in water, oil or other medium. This results in a high degree of hardness over the entire surface or part of the surface, without altering the structure or hardness of the rest of the metal, and with minimum deformation.

Isothermal hardening—hardening with intermediate cooling in a medium having a temperature lower than the temperature of pearlite formation and higher than that of martensite formation, the workpiece being held at this temperature for a definite length of time. Isothermal hardening makes it possible to obtain uniform physical and mechanical properties and a homogeneous structure throughout the workpiece, internal stresses being lowered and warping reduced.

Patenting—heating steel to a temperature above the transformation range followed by cooling in a bath of molten lead or salt, or in air. Patenting increases the capability of the metal to undergo plastic deformation during drawing and cold rolling, and also improves physical and mechanical properties.

Tempering—heating hardened steel to a temperature below the transformation range and holding it at this temperature followed by cooling. Tempering increases toughness without affecting tensile strength and elastic limit, and also reduces internal stresses and surface hardening due to cold working.

Ageing—prolonged holding of steel shapes at room temperature (natural ageing) or heating to a low temperature and holding at this temperature for a short time (artificial ageing). Ageing stabilizes the properties and dimensions of the shapes.

Carburizing—heating low-carbon steel in a carburizing medium to a temperature within or above the transformation range and holding it at that temperature followed by rapid or slow cooling. As a result the surface layer is saturated with carbon and gains in hardness while the soft and tough inner core remains unchanged.

Cyaniding—heating steel in a cyanide medium (thus saturating the surface with nitrogen and carbon) to minimum 500°C, holding it at this temperature and cooling. Cyaniding increases hardness, wear resistance and cutting properties.

Nitriding—heating steel in ammonia gas to minimum 450°C and holding it at this temperature for a lengthy period followed by cooling. Nitriding increases the hardness and wear resistance and improves anticorrosive properties in a thin surface layer.

TEMPER AND HEATED STEEL COLOURS

Colour after Tempering at Various Temperatures

220°C—straw
230°C—golden
240°C—brown
250°C—red-brown
260°C—purple
280°C—violet
300°C—blue (cornflower blue)
320°C—light blue
330°C—350°—light grey

Colour of Heated Steel at Various Temperatures

550°C—dark brown
630°C—brown-red
680°C—dark red
740°C—dark cherry-red
770°C—cherry-red
800°C—bright or light cherry-red
850°C—bright or light red
900°C—bright red
950°C—yellow-red
1000°C—yellow
1100°C—bright or light yellow
1200°C—yellow white
1300°C—white

The heated steel and temper colours vary depending on the light.

The temper colour is greatly affected by the length of time the steel is held at the given temperature.

The temper colours in the table are valid only for carbon steel. These colours appear on high-alloy steels at higher temperatures.

IRON-CARBON PHASE DIAGRAM

Iron exists in several allotropic forms and in combination with carbon forms a number of solid solutions.

In the diagram, point *C* is called the eutectic point.

Carbon alloys below the eutectic point are called hypo-eutectic cast irons while those containing more than 4.3% carbon are hyper-eutectic cast irons.

The transformation from the solid solution is called the eutectoid transformation, and the resulting uniform mixture of phases—the eutectoid. Line *PK* is the eutectoid line and point *S*—the eutectoid point.

The temperatures at which transformation takes place in steels in solid state are called critical points.

Critical points during heating are designated A_c, and those during cooling, A_r; irrespective of heating or cooling, they are designated *A*.

The critical points at different temperatures correspond to the transformation of steel from one modification to another.

The point of transition of iron from solid to liquid state and vice versa lies at 1530°C.

A_4—transition of Fe δ $\rightleftarrows$ Fe γ at 1401°C

A_3—transition of Fe γ $\leftrightarrows$ Fe α at 906°C

A_2—transition of Fe α non-magnetic $\rightleftarrows$ Fe α magnetic at 768°C

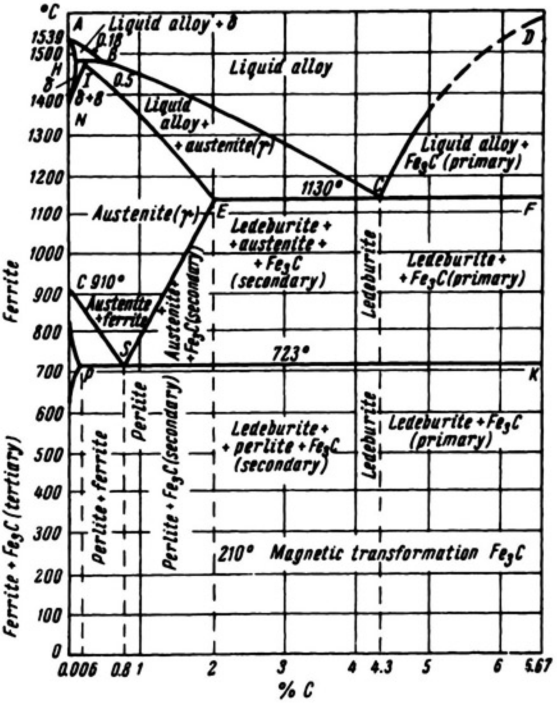
The first two points, A_4 and A_3, correspond to allotropic transformations, i.e., transformations that are accompanied by profound structural changes in the metal and changes in its physical properties. The third point, A_2, corresponds to magnetic transformations.

On heating, the critical points occur at higher temperatures than on cooling. The difference in the critical temperatures on heating and cooling is called the thermal hysteresis.

Besides these, there are two other points in steel, A_1 and A_{ct} (cementite), which are not found in pure iron, since these points have to do with transformations of carbon.

Point A_1 lies at a definite temperature (700°C), regardless of the carbon content of iron or steel.

Point A_{ct} rises with the increase in the carbon content of steel.


°C
1539
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
A
Liquid alloy + δ
0.18
B
H
δ
I
0.5
δ + δ
N
Liquid alloy
Liquid alloy + + austenite(γ)
1130°
C
D
Liquid alloy + Fe₃C (primary)
Austenite(γ)
E
F
Ledeburite + + austenite + + Fe₃C (secondary)
Ledeburite
Ledeburite + + Fe₃C(primary)
Ferrite
C 910°
Austenite + ferrite
Austenite + + Fe₃C(secondary)
S
723°
P
K
Perlite
Perlite + ferrite
Perlite + Fe₃C(secondary)
Ledeburite + + perlite + Fe₃C (secondary)
Ledeburite
Ledeburite + Fe₃C (primary)
Ferrite + Fe₃C (tertiary)
210° Magnetic transformation Fe₃C
0.006
0.8
1
2
3
4
4.3
5
6
6.67
% C

TERMS, DEFINITIONS, SYMBOLS AND DIMENSIONS OF MECHANICAL PROPERTIES

Tension

Strength is that property of a material which causes it to resist rupture under the action of stress.

Ultimate tensile strength (tensile strength), σ_u, *kg/mm²*, is the stress corresponding to the maximum load preceding rupture of the specimen.

Technical yield point (offset stress), $\sigma_{0.2}$; $\sigma_{0.3}$, *etc.*, *kg/mm²*, is the stress at which the permanent deformation reaches 0.2% or some other value of the same order as stipulated in the technical specification.

Physical yield point (yield point), σ_s, *kg/mm²*, is the minimum stress at which flow of the material takes place (if the material possesses this property).

Elasticity is the property of a material by virtue of which it reverts to its original shape after the action of external forces has ceased.

Technical elastic limit (elastic limit), σ_e, *kg/mm²*, is the stress at which the permanent deformation reaches a certain small value, e. g., 0.001, 0.003, 0.005, 0.02%, as stipulated in the technical specification.

Technical limit of proportionality (limit of proportionality), σ_p, *kg/mm²*, is the stress at which the deviation from the constant ratio between stress and deformation (Hooke's law) reaches a certain degree stipulated in the technical specification (e. g., an increase in the tangent of the angle between the deformation curve and the stress coordinate of 10, 25 or 50% of its original value).

Relative elongation (elongation), δ_5; δ_{10}; $\delta_{11.3} \cdot \sqrt{F_0}$, %, is the increase in length of a specimen under tension as related to its original length.

Relative reduction of area (reduction of area), ψ_k, %, is the cross-section area of a specimen under tension as related to its original cross-section area.

Torsion

Torsional strength, *kg/mm²*, is the tangential stress calculated from the formulae for elastic torsion and corresponding to the maximum torsional moment preceding the rupture of the specimen.

Torsional yield point, $\tau_{0.2}$; $\tau_{0.3}$, *kg/mm*^{2}, is the tangential stress calculated from the formulae for elastic torsion, at which the permanent elongation at the surface of the specimen reaches 0.2% or some other value of the same order as stipulated in the technical specification.

Technical torsional elastic limit (*torsional elastic limit*) τ_e, *kg/mm*^{2}, is the tangential stress calculated from the formulae for elastic torsion, at which the permanent deformation on the surface of the specimen reaches a certain small value as stipulated in the technical specification (e.g., 0.001, 0.002, 0.005, 0.03%).

Technical torsional proportionality limit (*torsional proportionality limit*) τ_p, *kg/mm*^{2}, is the tangential force calculated from the formulae for elastic torsion at which the deviation from the constant ratio between stress and strain (Hooke's law) at the surface of the specimen reaches a certain degree as stipulated in the technical specification (e. g., an increase in the tangent of the angle between the deformation curve and the stress coordinate of 10, 25 or 50% of its original value).

Fatigue

Stress cycle (cycle), N, is a complete cycle of stress variations consisting of a continuous series of values.

Symmetrical cycle is a cycle in which the maximum and minimum stresses are equal in magnitude but opposite in sign.

Asymmetrical cycle is a cycle in which the maximum and minimum stresses are unequal.

Endurance limit at symmetrical cycles, σ_{-1}, τ_{-1}, *kg/mm*^{2}, is the maximum stress of a symmetrical cycle that can be repeated N times without fracturing the specimen, where N is a number stipulated in the technical specification (e.g., 10^6, 10^7, 10^8).

Note. The words "symmetrical cycle" are added only when it is necessary to distinguish from "asymmetrical cycle". σ – normal stress; τ – tangential stress.

Endurance limit at asymmetrical cycles, σ_{-k}, τ_{-k}, *kg/mm*^{2}, is the maximum stress of an asymmetrical cycle that can be repeated N times without fracturing the specimen, where N is a number stipulated in the technical specification (e. g., 10^6, 10^7, 10^8).

Creep

Creep velocity, V, %/hr, is the velocity of plastic deformation at a given moment and a given stress during creep.

Creep deformation is the amount of plastic deformation of a specimen during a given interval of time.

Creep limit, σ, kg/mm², is the stress at which creep velocity or creep deformation following a definite interval after the beginning of creep reaches the value stipulated in the technical specification (e.g., a velocity of 10^{-4} or 10^{-5} relative elongation per hour, or creep deformation in % relative elongation after 100,000 hrs, etc.).

Impact

Impact strength, A, kg/cm², is the mechanical expression of resistance to shock and is equal to the work performed in breaking a specimen in a testing machine.

Specific impact strength, A_k, kgcm/cm², is resistance to shock referred to a cross-section of a supported specimen.

Brittleness is the property of a material causing it to rupture without any noticeable absorption of mechanical energy in an irreversible form (without noticeable plastic deformation).

Ductility is the property of a material enabling it to absorb noticeable amounts of mechanical energy in an irreversible form without breaking.

Endurance is the property of a material enabling it to withstand a large number of repetitions of fluctuating stresses.

Hardness

Hardness is the property of a material which causes it to resist the penetration of another body.

Static Hardness

Hardness test with a steel ball (Brinell method), HB. Hardness is determined by forcing a steel ball into the specimen or piece to be tested, under standard conditions, and is computed by dividing the load by the diameter of the impression produced. Hardness is sometimes designated as *HB* 10/3000/15, where 10 is the diameter of the ball in millimetres, 3000—the load in kg, and 15—the time the pressure is maintained in sec. The diameters of standard balls have been set at 10, 5 and 2.5 mm.

Hardness test with a conical diamond point or steel ball after a preliminary load (Rockwell method), $R_{c.}$ Standard tips are used: a diamond cone with an angle of 120° or a steel ball 1.588 mm in diameter (1/16 in.). Hardness is measured by pressing the diamond cone or steel ball into the specimen with two consecutive loads (preliminary and final).

Hardness test with a diamond pyramid (Vickers method), HV. Hardness is determined by pressing into the specimen a regular square pyramid with an apical angle of 136°. The hardness number is obtained by dividing the load in kg by the lateral area of the indentation in mm². The lateral area of the pyramidal indentation is calculated from the length of the diagonal.

Hardness test by the rebound method (Shore method), HSh. Hardness is determined by measuring the rebound of a standard hammer freely falling from a constant height. The hammer is made of steel and has a diamond tip.

MECHANICAL UNITS

ГОСТ (U.S.S.R. State Standard) 7664-55

1. The standard establishes the systems of units for measuring mechanical quantities, as well as units not included in the systems.

2. The use of the following three systems for measuring mechanical quantities is permissible:

(a) M.K.S. system, the fundamental units of which are the metre, the kilogram and the second (Table 1);

(b) C.G.S. system, the fundamental units of which are the centimetre, the gram and the second (Table 2);

(c) M.Kgf. S. system, the fundamental units of which are the metre, the kilogram of force and the second (Table 3).

Preference should be given to the M.K.S. system.

It is also permissible to use units not included in these systems that are multiples and fractions of the fundamental and derived units, formed in accordance with ГОСТ 7663-55, as well as the units listed in Table 4.

3. In all systems the radian and steradian should be used as the units of plane and solid angle (see supplement to tables).

Table 1

M.K.S. System (metre-kilogram-second)

Names		Abbreviation of unit		Dimensions
Quantity	Unit	Russian	Latin	
		Fundamental units		
Length	metre	*м*	m	See supplement
Mass	kilogram	*кг*	kg	
Time	second	*сек*	sec	
		Principal derived units		
Frequency	hertz (cycles per second)	*гц*	Hz (c/s)	(1) : (sec)
Angular velocity	—	*рад/сек*	rad/sec	(1 rad) : (1 sec)
Angular acceleration	—	*рад/сек*^{2}	rad/ /sec^2	(1 rad) : (1 sec)^2
Velocity	—	*м/сек*	m/sec	(1 m) : (1 sec)
Acceleration	—	*м/сек*^{2}	m/sec^2	(1 m) : (1 sec)^2
Area	square metre	*м*^{2}	m^2	(1 m)^2
Volume	cubic metre	*м*^{3}	m^3	(1 m)^3
Density	—	*кг/м*^{3}	kg/m^3	(1 kg) : (1 m)^3
Force	Newton	*н*	N	(1 kg) . (1 m):(1 sec)^2
Specific gravity	—	*н/м*^{3}	N/m^3	(1 N) : (m)^3
Moment of inertia (dynamic)	—	*кг·м*^{2}	kg·m^2	(1 kg) · (1 m)^2
Work and energy	Joule	*дж*	J	(1 N) · (1 m)
Power	Watt	*вт*	W	(1 J) : (1 sec)
Tension (pressure)	—	*н/м*^{2}	N/m^2	(1 N) : (1 m)^2
Dynamic viscosity	—	*н·сек/м*^{2}	N· ·sec/m^2	(1 N) · (1 sec):(1 m)^2
Kinematic viscosity	—	*м*^{2}*/сек*	m^2/sec	(1 m)^2 : (1 sec)

Table 2

C.G.S. System (centimetre-gram-second)

Names		Abbreviation of unit		Dimensions
Quantity	Unit	Russian	Latin	
Fundamental units				
Length	centimetre	*см*	cm	See supplement
Mass	gram	*г*	g	
Time	second	*сек*	sec	
Principal derived units				
Frequency	hertz (cycles per second)	*гц*	Hz (c/s)	(1):(sec)
Angular velocity	—	*рад/сек*	rad/sec	(1 rad):(1 sec)
Angular acceleration	—	*рад/сек*^{2}	rad/sec^2	(1 rad):(1 sec)^2
Velocity	—	*см/сек*	cm/sec	(1 cm):(1 sec)
Acceleration	—	*см/сек*^{2}	cm/sec^2	(1 cm):(1 sec)^2
Area	square centimetre	*см*^{2}	cm^2	(1 cm)^2
Volume	cubic centimetre	*см*^{3}	cm^3	(1 cm)^3
Density	—	*г/см*^{3}	g/cm^3	(1 g):(1 cm)^3
Force	dyne	*дин*	dyne	(1 g)·(1 cm):(1 sec)^2
Specific gravity	—	*дин/см*^{3}	dyne/cm^3	(1 dyne):(1 cm)^3
Moment of inertia (dynamic)	—	*г·см*^{2}	g·cm^2	(1 g):(1 cm)^2
Work and energy	erg	*эрг*	erg	(1 dyne)·(1 cm)
Power	—	*эрг/сек*	erg/sec	(1 erg):(1 sec)
Tension (pressure)	—	*дин/см*^{2}	dyne/cm^2	(1 dyne):(1 cm)^2
Dynamic viscosity	poise	*пз*	p	(1 dyne)·(1 sec):(1 cm)^2
Kinematic viscosity	stokes	*ст*	St	(1 cm)^2:(1 sec)

Table 3

M.Kgf.S. System (metre-kilogram of force-second)

Names		Abbreviation of unit		Dimensions
Quantity	Unit	Russian	Latin	
Fundamental units				
Length	metre	*м*	m	See supplement
Force	kilogram-force	*кгс*	kgf *	
Time	second	*сек*	sec	
Principal derived units				
Frequency	hertz (cycles per second)	*гц*	Hz (c/s)	(1):(1 sec)
Angular velocity	—	*рад/сек*	rad/sec	(1 rad):(1 sec)
Angular acceleration	—	*рад/сек*^{2}	rad/sec^2	(1 rad):(1 sec)^2
Velocity	—	*м/сек*	m/sec	(1 m):(1 sec)
Acceleration	—	*м/сек*^{2}	m/sec^2	(1 m):(1 sec)^2
Area	square metre	*м*^{2}	m^2	(1 m)^2
Volume	cubic metre	*м*^{3}	m^3	(1 m)^3
Mass	—	*кгс·сек*^{2}*/м*	kg·sec^2/m	(kg)·(sec)^2:(1 m)
Specific gravity	—	*кгс/м*^{3}	kg/m^3	(1 kg):(1 m)^3
Density	—	*кгс·сек*^{2}*/м*^{4}	kg·sec^2/m^4	(1 kg)·(1 sec)^2::(1 m)^4
Moment of inertia (dynamic)	—	*кгс·м·сек*^{2}	kg·m·sec^2	(1 kg)·(1 m)·:(1 sec)^2
Work and energy	—	*кгс·м*	kg·m	(1 kg)·(1 m)
Power	—	*кгс·м/сек*	kg·m/sec	(1 kg)·(1 m)::(1 sec)
Tension (pressure)	—	*кгс/м*^{2}	kg/m^2	(1 kg):(1 m)^2
Dynamic viscosity	—	*кгс·сек/м*^{2}	kg·sec/m^2	(1 kg)·(1 sec)::(1 m)^2
Kinematic viscosity	—	*м*^{2}*/сек*	m^2/sec	(1 m)^2:(1 sec)

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* The kilogram of force may be abbreviated to kg.

Table 4

Units Not Included in the Systems

Names		Abbreviation of unit		Dimensions
Quantity	Unit	Russian	Latin	
Length	micron	*мк*	μ	1×10^{-6} m
Length	Angstrom	Å	Å	1×10^{-10} m
Mass	ton	*т*	t	1×10^{3} kg
Mass	centner	*цн*	—	1×10^{2} kg
Mass	carat	—	ct	2×10^{-4} kg
Time	hour	*час*	hr	3600 sec
Time	minute	*мин*	min	60 sec
Plane angle	degree	°	°	$\frac{\pi}{180}$ rad
Plane angle	minute	′	′	$\frac{\pi}{180}\times10^{-2}$ rad
Plane angle	second	″	″	$\frac{\pi}{648}\times10^{-3}$ rad
Area	are	*а*	a	100 m^2
Area	hectare	*га*	ha	1×10^{4} m^2
Volume	litre	*л*	l	$1.000028\times$ $\times10^{-3}$ m^3
Angle of revolution	revolution	*об*	—	2π rad
Angular velocity	revolution per minute	*об/мин*	rpm	$\frac{\pi}{30}$ rad/sec
Angular velocity	revolution per second	*об/сек*	rps	2π rad/sec
Force	ton of force	*тс*	—	9.80665×10^{3} N
Pressure	bar	*бар*	bar	10^{5} N/m^2
Power	horse-power	*л. с.*	hp	735.499 N (75 kg · m/sec)
Work	watt-hour	*вт. ч.*	wh	3.6×10^{3} J

Continued

Names		Abbreviation of unit		Dimensions
Quantity	Unit	Russian	Latin	
Pressure	millimetre of mercury column	*мм рт. ст.*	mm Hg	133.322 N/m^2
Pressure	technical atmosphere	*ат.* или *кгс/см*^{2}	at or kg/cm^2	9.80665×10^4 N/m^2
Pressure	millimetre of water column	*мм вод. ст.*	mm H_2O	9.80665 N/m^2

DEFINITIONS OF FUNDAMENTAL UNITS

Metre. The VII General Conference on Weights and Measures in 1927 adopted the following definition.

The unit of length, the metre, is defined as the distance between two lines at 0°C on a platinum-iridium bar deposited at the International Bureau of Weights and Measures and adopted as the Prototype Metre by the I General Conference on Weights and Measures, provided that the bar be at normal atmospheric pressure and supported by two rollers of at least 1 cm in diameter placed symmetrically in a single horizontal plane at a distance of 571 mm apart

Centimetre is one hundredth of a metre.

Kilogram. The III General Conference on Weights and Measures in 1901 adopted the following definition.

The kilogram, the unit of mass, is the mass of the International Prototype Kilogram.

Gram is one thousandth of a kilogram.

Second. The second is 1/31556925.975 of the tropical year for 1900.0 (1900.0 being 12 o'clock, Universal Time, January 1, 1900).

Kilogram of force is a force imparting to a mass equal to the mass of the International Prototype Kilogram an acceleration of 9.80665 m/sec^2.

Radian is the angle between two radii of a circle which cut off an arc equal in length to the radius.

Steradian—a solid angle whose apex is at the centre of a sphere and which cuts off a surface on the sphere equivalent to the square of the radius.

WIRE AND SHEET METAL GAUGES

Diameter or thickness in millimetres of the most frequent British and American gauges for iron and steel wire and sheets. There is one gauge for non-ferrous metals.

1 Gauge No.	2 British Sheet & Hoop Iron Standard Gauge (Birmingham Gauge)	3 U. S. Standard Gauge for Sheet & Plate Iron & Steel	4 Birmingham Wire Gauge (or Stabs' Iron Wire or Warrington Gauge)	5 British Imperial Standard Wire Gauge	6 American Steel & Wire Co. (or Washborn & Moen or Roebling or Steel Wire Gauge)	7 Washborn & Moen Steel Music Wire Gauge	8 New American Steel & Wire Co. Music Wire Gauge	9 American or Brown & Sharpe Wire Gauge
Abbreviations	BG	U. S. S. G.	BWG	I. S. W. G.	Am. S. & W. Co. or W & M or Sil. W. G.	—	—	A. W. G or B. & S. G.
00000000	17.99	—	—	—	—	0.211	—	—
0000000	16.93	—	—	12.70	12.45	0.221	—	—
000000	15.87	—	—	11.78	11.72	0.241	0.102	14.73
00000	14.94	—	12.70	10.97	10.93	0.254	0.127	13.12
0000	13.76	—	11.53	10.16	10.00	0.279	0.152	11.68
000	12.70	—	10.79	9.45	9.21	0.305	0.178	10.40
00	11.31	—	9.65	8.84	8.41	0.338	0.203	9.27
0	10.07	—	8.64	8.23	7.78	0.366	0.229	8.25
1	8.97	—	7.62	7.62	7.19	0.396	0.254	7.35
2	7.99	—	7.21	7.01	6.67	0.422	0.279	6.54
3	7.12	6.073	6.58	6.40	6.19	0.452	0.305	5.83
4	6.35	5.695	6.04	5.89	5.72	0.477	0.330	5.19

5	5.65	5.314	5.59	5.38	5.26	0.513	0.356	4.62
6	5.03	4.935	5.16	4.88	4.88	0.546	0.406	4.11
7	4.48	4.554	4.57	4.47	4.50	0.584	0.457	3.66
8	3.99	4.176	4.19	4.06	4.11	0.617	0.508	3.26
9	3.55	3.797	3.76	3.66	3.77	0.650	0.559	2.91
10	3.18	3.416	3.40	3.25	3.43	0.686	0.610	2.59
11	2.83	3.038	3.05	2.95	3.06	0.721	0.660	2.30
12	2.52	2.657	2.77	2.64	2.68	0.752	0.737	2.05
13	2.24	2.278	2.41	2.34	2.32	0.797	0.787	1.83
14	1.99	1.897	2.11	2.03	2.03	0.828	0.838	1.63
15	1.77	1.709	1.83	1.83	1.83	0.876	0.889	1.45
16	1.59	1.519	1.65	1.625	1.59	0.914	0.940	1.29
17	1.41	1.366	1.47	1.422	1.37	0.958	0.991	1.15
18	1.26	1.214	1.24	1.219	1.21	1.00	1.041	1.02
19	1.12	1.062	1.07	1.016	1.04	1.05	1.09	0.91
20	1.00	0.912	0.89	0.914	0.88	1.10	1.14	0.81
21	0.89	0.836	0.81	0.813	0.81	1.17	1.19	0.72
22	0.79	0.759	0.71	0.711	0.73	1.23	1.24	0.64
23	0.71	0.683	0.63	0.610	0.65	1.30	1.29	0.57
24	0.63	0.607	0.56	0.559	0.58	1.40	1.40	0.51
25	0.56	0.531	0.51	0.508	0.52	1.49	1.50	0.45
26	0.50	0.455	0.46	0.457	0.46	1.59	1.60	0.40
27	0.44	0.417	0.41	0.417	0.44	1.67	1.70	0.36
28	0.40	0.378	0.36	0.376	0.41	1.83	1.80	0.32
29	0.35	0.343	0.33	0.345	0.38	1.93	1.90	0.29
30	0.31	0.305	0.305	0.315	0.36	2.03	2.03	0.25
31	0.28	0.267	0.254	0.295	0.33	—	2.16	0.23
32	0.25	0.246	0.229	0.274	0.325	—	2.29	0.20
33	0.22	0.229	0.203	0.254	0.300	—	2.41	0.18
34	0.20	0.208	0.178	0.234	0.264	—	—	0.16
35	0.18	0.190	0.127	0.213	0.241	—	—	0.14
36	0.15	0.170	0.102	0.193	0.229	—	—	0.13
37	0.14	0.163	—	0.173	0.216	—	—	0.11
38	0.12	0.152	—	0.152	0.203	—	—	0.10
39	0.11	—	—	0.132	0.191	—	—	0.09
40 (up to 50)	0.10	—	—	0.122	0.178	—	—	0.08

NOTES TO THE TABLE

(The numbers are those of the columns)

2. Used in Great Britain for sheets and strips but in the United States only for strips (for black sheet see columns 3 and 4).

3. This gauge is used in the United States for black sheet (cf. U. S. Steel Export Co. General Catalog, 1948, p. 561).

4. Used in Great Britain and the United States for wire (in the United States also used for black sheet and strips).

5. Used in Great Britain for iron and steel wire; in the United States it is also used for copper wire.

6. The United States Bureau of Standards combines these gauges under the name "Steel Wire Gauge" or "American Steel Wire Gauge." This is the most widely used gauge for wire in the United States.

7 and 8. For music wire.

9. Used in the United States for non-ferrous wire and sheets. The fractions have been approximated.

BRINELL HARDNESS TEST

ГОСТ 9012-59

The following relations should be observed in choosing the ball diameter *D*, the load *P* and the time the pressure is maintained.

Material	Hardness range, Brinell numbers	Minimum thickness of test specimen, mm	Relation between load *P* and ball diameter *D*	Ball diameter *D*, mm	Load *P*, kg	Time under pressure se
Ferrous metals	140—450	from 6 to 3	$P=30\ D^2$	10.0	3000	10
		from 4 to 2		5.0	750	
		less than 2		2.5	187.5	
	140	over 6	$P=10\ D^2$	10.0	1000	10
		from 6 to 3		5.0	250	
		less than 3		2.5	62.5	

The Brinell hardness number (HB) is found by dividing the load P (kg) by the area of the resulting spherical impression (mm^2) and can be computed from the following formula:

$$HB=\frac{2P}{\pi D\cdot(D-\sqrt{D^2-d^2})}$$

where P—load in kg;
D—diameter of ball in mm;
d—diameter of impression in mm.

Brinell Hardness Number Table

Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to			Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to		
	$30D^2$	$10D^2$	$2.5D^2$		$30D^2$	$10D^2$	$2.5D^2$
2.89	448			3.12	383	128	31.9
2.90	444			3.13	380	127	31.7
2.91	441			3.14	378	126	31.5
2.92	438			3.15	375	125	31.3
2.93	435			3.16	373	124	31.1
2.94	432			3.17	370	123	30.9
2.95	429			3.18	368	123	30.7
2.96	426			3.19	366	122	30.5
2.97	423			3.20	363	121	30.3
2.98	420		35.0	3.21	361	120	30.1
2.99	417		34.8	3.22	359	120	29.9
3.00	415		34.6	3.23	356	119	29.7
3.01	412		34.3	3.24	354	118	29.5
3.02	409		34.1	3.25	352	117	29.3
3.03	406		33.9	3.26	350	117	29.2
3.04	404		33.7	3.27	347	116	29.0
3.05	401		33.4	3.28	345	115	28.8
3.06	398		33.2	3.29	343	114	28.6
3.07	395		33.0	3.30	341	114	28.4
3.08	393		32.7	3.31	339	113	28.2
3.09	390	130	32.5	3.32	337	112	28.1
3.10	388	129	32.3	3.33	335	112	27.9
3.11	385	128	32.1	3.34	333	111	27.7

Continued

Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to			Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to		
	$30D^2$	$10D^2$	$2.5D^2$		$30D^2$	$10D^2$	$2.5D^2$
3.35	331	110	27.6	3.70	269	89.7	22.4
3.36	329	110	27.4	3.71	268	89.2	22.3
3.37	326	109	27.2	3.72	266	88.7	22.2
3.38	325	108	27.1	3.73	265	88.2	22.1
3.39	323	108	26.9	3.74	263	87.7	21.9
3.40	321	107	26.7	3.75	262	87.2	21.8
3.41	319	106	26.6	3.76	260	86.8	21.7
3.42	317	106	26.4	3.77	259	86.3	21.6
3.43	315	105	26.2	3.78	257	85.8	21.5
3.44	313	104	26.1	3.79	256	85.3	21.3
3.45	311	104	25.9	3.80	255	84.9	21.2
3.46	309	103	25.8	3.81	253	84.4	21.1
3.47	307	102	25.6	3.82	252	84.0	21.0
3.48	306	102	25.5	3.83	250	83.5	20.9
3.49	304	101	25.3	3.84	249	83.0	20.8
3.50	302	101	25.2	3.85	248	82.6	20.7
3.51	300	100	25.0	3.86	246	82.1	20.5
3.52	298	99.5	24.9	3.87	245	81.7	20.4
3.53	297	98.9	24.7	3.88	244	81.3	20.3
3.54	295	98.3	24.6	3.89	242	80.8	20.2
3.55	293	97.7	24.5	3.90	241	80.4	20.1
3.56	292	97.2	24.3	3.91	240	80.0	20.0
3.57	290	96.6	24.2	3.92	239	79.6	19.9
3.58	288	96.1	24.0	3.93	237	79.1	19.8
3.59	286	95.5	23.9	3.94	236	78.7	19.7
3.60	285	95.0	23.7	3.95	235	78.3	19.6
3.61	283	94.4	23.6	3.96	234	77.9	19.5
3.62	282	93.9	23.5	3.97	232	77.5	19.4
3.63	280	93.3	23.3	3.98	231	77.1	19.3
3.64	278	92.8	23.2	3.99	230	76.7	19.2
3.65	277	92.3	23.1	4.00	229	76.3	19.1
3.66	275	91.8	22.9	4.01	228	75.9	19.0
3.67	274	91.2	22.8	4.02	226	75.5	18.9
3.68	272	90.7	22.7	4.03	225	75.1	18.8
3.69	271	90.2	22.6	4.04	224	74.7	18.7

Continued

Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to			Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to		
	$30D^2$	$10D^2$	$2.5D^2$		$30D^2$	$10D^2$	$2.5D^2$
4.05	223	74.3	18.6	4.40	187	62.6	15.6
4.06	222	73.9	18.5	4.41	186	62.1	15.5
4.07	221	73.5	18.4	4.42	185	61.8	15.5
4.08	219	73.2	18.3	4.43	185	61.5	15.4
4.09	218	72.8	18.2	4.44	184	61.2	15.3
4.10	217	72.4	18.1	4.45	183	60.9	15.2
4.11	216	72.0	18.0	4.46	182	60.6	15.2
4.12	215	71.7	17.9	4.47	181	60.4	15.1
4.13	214	71.3	17.8	4.48	180	60.1	15.0
4.14	213	71.0	17.7	4.49	179	59.8	15.0
4.15	212	70.6	17.6	4.50	179	59.5	14.9
4.16	211	70.2	17.6	4.51	178	59.2	14.8
4.17	210	69.9	17.5	4.52	177	59.0	14.7
4.18	209	69.5	17.4	4.53	176	58.7	14.7
4.19	208	69.2	17.3	4.54	175	58.4	14.6
4.20	207	68.8	17.2	4.55	174	58.1	14.5
4.21	205	68.5	17.1	4.56	174	57.9	14.5
4.22	204	68.2	17.0	4.57	173	57.6	14.4
4.23	203	67.8	17.0	4.58	172	57.3	14.3
4.24	202	67.5	16.9	4.59	171	57.1	14.3
4.25	201	67.1	16.8	4.60	170	56.8	14.2
4.26	200	66.8	16.7	4.61	170	56.5	14.1
4.27	199	66.5	16.6	4.62	169	56.3	14.1
4.28	198	66.2	16.5	4.63	168	56.0	14.0
4.29	198	65.8	16.5	4.64	167	55.8	13.9
4.30	197	65.5	16.4	4.65	167	55.5	13.9
4.31	196	65.2	16.3	4.66	166	55.3	13.8
4.32	195	64.9	16.2	4.67	165	55.0	13.8
4.33	194	64.6	16.1	4.68	164	54.8	13.7
4.34	193	64.2	16.1	4.69	164	54.5	13.6
4.35	192	63.9	16.0	4.70	163	54.3	13.6
4.36	191	63.6	15.9	4.71	162	54.0	13.5
4.37	190	63.3	15.8	4.72	161	53.8	13.4
4.38	189	63.0	15.8	4.73	161	53.5	13.4
4.39	188	62.7	15.7	4.74	160	53.3	13.3

Continued

Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load *P* (kg) is equal to			Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load *P* (kg) is equal to		
	$30D^2$	$10D^2$	$2.5D^2$		$30D^2$	$10D^2$	$2.5D^2$
4.75	159	53.0	13.3	5.10	137	45.5	11.4
4.76	158	52.8	13.2	5.11	136	45.3	11.3
4.77	158	52.6	13.1	5.12	135	45.1	11.3
4.78	157	52.3	13.1	5.13	135	45.0	11.3
4.79	156	52.1	13.0	5.14	134	44.8	11.2
4.80	156	51.9	13.0	5.15	134	44.6	11.2
4.81	155	51.7	12.9	5.16	133	44.4	11.1
4.82	154	51.4	12.9	5.17	133	44.2	11.1
4.83	154	51.2	12.8	5.18	132	44.0	11.0
4.84	153	51.0	12.8	5.19	132	43.8	11.0
4.85	152	50.7	12.7	5.20	131	43.7	10.9
4.86	152	50.5	12.6	5.21	130	43.5	10.9
4.87	151	50.3	12.6	5.22	130	43.3	10.8
4.88	150	50.1	12.5	5.23	129	43.1	10.8
4.89	150	49.8	12.5	5.24	129	42.9	10.7
4.90	149	49.6	12.4	5.25	128	42.8	10.7
4.91	148	49.4	12.4	5.26	128	42.6	10.6
4.92	148	49.2	12.3	5.27	127	42.4	10.6
4.93	147	49.0	12.3	5.28	127	42.2	10.6
4.94	146	48.8	12.2	5.29	126	42.1	10.5
4.95	146	48.6	12.2	5.30	126	41.9	10.5
4.96	145	48.4	12.1	5.31	125	41.7	10.4
4.97	144	48.1	12.0	5.32	125	41.5	10.4
4.98	144	47.9	12.0	5.33	124	41.4	10.3
4.99	143	47.7	11.9	5.34	124	41.2	10.3
5.00	143	47.5	11.9	5.35	123	41.0	10.3
5.01	142	47.3	11.8	5.36	123	40.9	10.2
5.02	141	47.1	11.8	5.37	122	40.7	10.2
5.03	141	46.9	11.7	5.38	122	40.5	10.1
5.04	140	46.7	11.7	5.39	121	40.4	10.1
5.05	140	46.5	11.6	5.40	121	40.2	10.1
5.06	139	46.3	11.6	5.41	120	40.0	10.0
5.07	138	46.1	11.5	5.42	120	39.9	9.97
5.08	138	45.9	11.5	5.43	119	39.7	9.94
5.09	137	45.7	11.4	5.44	119	39.6	9.90

Continued

Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to			Diameter of impression d_{10} or $2d_5$ or $4d_{2.5}$	Brinell hardness number if load P (kg) is equal to		
	$30D^2$	$10D^2$	$2.5D^2$		$30D^2$	$10D^2$	$2.5D^2$
5.45	118	39.4	9.86	5.73	106	35.3	8.83
5.46	118	39.2	9.82	5.74	105	35.1	8.79
5.47	117	39.1	9.78	5.75	105	35.0	8.76
5.48	117	38.9	9.73	5.76	105	34.9	8.73
5.49	116	38.8	9.70	5.77	104	34.7	8.69
5.50	116	38.6	9.66	5.78	104	34.6	8.66
5.51	115	38.5	9.62	5.79	103	34.5	8.63
5.52	115	38.3	9.58	5.80	103	34.3	8.59
5.53	114	38.2	9.54	5.81	103	34.2	8.56
5.54	114	38.0	9.50	5.82	102	34.1	8.53
5.55	114	37.9	9.46	5.83	102	33.9	8.49
5.56	113	37.7	9.43	5.84	101	33.8	8.46
5.57	113	37.6	9.38	5.85	101	33.7	8.43
5.58	112	37.4	9.35	5.86	101	33.6	8.40
5.59	112	37.3	9.31	5.87	100	33.4	8.36
5.60	111	37.1	9.27	5.88	99.9	33.3	8.33
5.61	111	37.0	9.24	5.89	99.5	33.2	8.29
5.62	110	36.8	9.20	5.90	99.2	33.1	8.26
5.63	110	36.7	9.17	5.91	98.8	32.9	8.23
5.64	110	36.5	9.14	5.92	98.4	32.8	8.20
5.65	109	36.4	9.10	5.93	98.0	32.7	8.17
5.66	109	36.3	9.07	5.94	97.7	32.6	8.14
5.67	108	36.1	9.03	5.95	97.3	32.4	8.11
5.68	108	36.0	9.00	5.96	96.9	32.3	8.08
5.69	107	35.8	8.97	5.97	96.6	32.2	8.05
5.70	107	35.7	8.93	5.98	96.2	32.1	8.02
5.71	107	35.6	8.90	5.99	95.9	32.0	7.99
5.72	106	35.4	8.86	6.00	95.5	31.8	7.96

ROCKWELL HARDNESS TEST

ГОСТ 9013-59

In the Rockwell method, hardness is measured in arbitrary units. The unit of hardness is a quantity corresponding to a 0.002-mm axial displacement of the indenting tip.

The Rockwell hardness number R_c is obtained from the following formulae:

for scales A and C:

$$R_c = 100 - e$$

for scale B:

$$R_c = 130 - e$$

The quantity e is determined by the formula:

$$e = \frac{h - h_0}{0.002},$$

where h_0 is the depth of penetration of the tip into the specimen under the action of the preliminary load P_0.

With scales A and C, hardness is measured by forcing a conical diamond point into the specimen with two consecutive loads:

scale A:

$P_0 = 10$ kg

$P_1 = 50$ kg

$P = 10 + 50 = 60$ kg

scale C:

$P_0 = 10$ kg

$P_1 = 140$ kg

$P = 10 + 140 = 150$ kg

With scale B, hardness is measured by forcing a steel ball into the specimen with two consecutive loads:

$P_0 = 10$ kg

$P_1 = 90$ kg

$P = 10 + 90 = 100$ kg

Approximate maximum thickness of specimen to be tested, depending on expected Rockwell hardness number:

Scale	Rockwell hardness number	Maximum thickness of specimen, mm	Scale	Rockwell hardness number	Maximum thickness of specimen, mm
A	70	0.7	B	80	1.0
A	80	0.5	B	90	0.8
A	90	0.4	B	100	0.7
B	25	2.0	C	20	1.5
B	30	1.9	C	30	1.3
B	40	1.7	C	40	1.2
B	50	1.5	C	50	1.0
B	60	1.3	C	60	0.8
B	70	1.2	C	67	0.7

COMPARISON OF HARDNESS NUMBERS OBTAINED BY DIFFERENT METHODS

Diameter of impression (Brinell). Ball diameter 10 mm, load 3,000 kg	Hardness numbers			
	Brinell, HB	Rockwell (scale *C*—diamond cone, load 150 kg), R_c	Vickers, HV	Shore, HSh
5.00	143	—	143	23
4.90	149	—	149	24
4.80	156	—	155	26
4.70	163	2	162	27
4.60	170	4	171	28
4.50	179	7	178	29
4.40	187	9	186	30
4.30	197	12	197	31

Continued

Diameter of impression (Brinell). Ball diameter 10 mm, load 3,000 kg	Hardness numbers			
	Brinell, HB	Rockwell (scale *C*—diamond cone, load 150 kg), R_c	Vickers, HV	Shore, HSh
4.20	207	14	208	33
4.10	217	17	217	34
4.00	229	20	228	36
3.90	241	23	240	38
3.80	255	25	255	40
3.70	269	27	270	42
3.60	285	29	285	44
3.50	302	31	303	46
3.40	321	33	320	49
3.30	341	36	344	51
3.20	363	39	380	54
3.10	388	41	401	57
3.00	415	43	435	61
2.90	444	46	474	64
2.80	477	49	534	68
2.70	514	52	587	73
2.60	555	56	650	78
2.50	600	60	746	84
2.40	653	64	868	91
2.35	682	66	941	94
2.30	712	68	1022	98
2.25	745	70	1116	102
2.20	780	72	1220	106
2.10	857	—	—	—
2.00	946	—	—	—

PHYSICAL AND CHEMICAL PROPERTIES OF REFRACTORIES

Type or name	Content, %					Refractoriness, minimum	Linear change, %, after firing at °C, maximum	Initial deformation temperature at load of 2 kg/cm², at °C, minimum	Compressive strength, kg/cm², minimum	Apparent porosity, %, maximum	Other properties
	SiO_2 min.	Al_2O_3 max.	Al_2O_3 + TiO_2	CaO max.	C min.						
Dinas shapes (ГОСТ 4157-48)											
Dinas, special purpose	94.5	1.5		2.8		ПК171 (1710°C)	—	1660	225	23	Sp. gr. max. 2.36
Class I	94.5	1.5		—		ПК171 (1710°C)	—	1650	200	23	2.38
Class II	93	—		—		ПК169 (1690°C)	—	1620	175	25	2.40

Continued

Type or name	Content, %					Refractoriness, minimum	Linear change, %, after firing at °C, maximum	Initial deformation temperature at load of 2 kg/cm² at °C, minimum	Compressive strength, kg/cm², minimum	Apparent porosity, %, maximum	Other properties
	SiO_2 min.	Al_2O_3 max.	Al_2O_3 + TiO_2	CaO max.	C min.						
Chamotte shapes (ГОСТ 390-54)											
Type A	—	—	$\geqslant 30$	—		1730°C	0.7—1400	1300	125	30	—
Type B	—	—	$\geqslant 30$	—		1670°C	0.7—1350	—	125	30	—
Type C	—	—	$\geqslant 30$	—		1610°C	0.7—1250	—	100	—	—
Semi-acid refractories (ГОСТ 4873-49)											
Type A	65	—	$\leqslant 30$	—		ПК171 (1710°C)	0.5—1400	1400	100	27	—
Type B	65	—	$\leqslant 30$	—		ПК167 (1670°C)	0.5—1350	1300	150	30	—
Type C	65	—	$\leqslant 30$	—		ПК161 (1610°C)	0.5—1250	—	100	—	—

Refractories containing graphite (ГОСТ 8708-58)

Semi-dry press shapes										Bulk weight, g cm^3, minimum 1.8
Crucibles	—	—	⩾34	—	45		—	—	—	27	Fired at 1250–1300°C, with glazed surface
Plastic formed shapes										
Crucibles and retorts	—	—	⩾34	—	45	—	—	—	—	35	1.6 fired at 750—800°C
Baths	—	—	⩾34	—	—	—	—	—	—	34	1.65 unglazed
Muffles	—	—	⩾34	—	—	—	—	—	—	38	1.68

CHEMICAL COMPOSITION
OF CAST IRON,
FERROALLOYS AND STEELS
OF VARIOUS GRADES

SYMBOLS FOR ELEMENTS AS USED IN THE TABLES

Element	Symbol used in chemical composition tables	Symbol used in standard markings
Carbon	C	У
Manganese	Mn	Г
Silicon	Si	С
Phosphorus	P	—
Sulphur	S	—
Chromium	Cr	Х
Nickel	Ni	Н
Molybdenum	Mo	М
Tungsten	W	В
Vanadium	V	Ф
Aluminium	Al	Ю
Titanium	Ti	Т
Copper	Cu	Д
Niobium	Nb	Б
Boron	B	Р
Cobalt	Co	К
Nitrogen	N	—

CAST

Type	Grade	Chemical					
		Si	Mn				
			Group			A	Б
			I	II	III	maxi	
						Cast Iron for	
Coke	M1	0.76—1.25	up to 1.0	1.01—1.75	—	0.15	0.20
Open hearth	M2	up to 0.75	up to 1.0	1.01—1.75	—	0.15	0.20
Coke Bessemer	Б1	1.26—1.75	0.6—1.2	0.6—1.2	—	—	0.07
	Б2	0.70—1.25	0.5—0.8	0.5—0.8	—	—	0.07
Coke basic Bessemer	T	0.20—0.60	0.8—1.3	0.8—1.3	—	—	1.6—2.0
Open hearth charcoal	МД1	0.76—1.25	min. 1.20			0.20	0.30
	МД2	0.15—0.75	min. 0.70			0.20	0.30
High quality coke	ПВК1	1.26—1.75	up to 1.0	1.01—1.75	—	0.020	0.025
	ПВК2	0.76—1.25	up to 1.0	1.01—1.75	—	0.020	0.025
	ПВК3	up to 0.75	up to 1.0	1.01—1.75	—	0.020	0.025
High quality charcoal	ПВД1	1.21—1.75	1.5—2.75			0.020	0.021—0.025
	ПВД2	0.61—1.20	1.0—2.5			0.020	0.021—0.025
	ПВД3	0.10—0.60	1.0—2.0			0.020	0.021—0.025
							Foundry
Coke	ЛК0	3.26—3.75	up to 0.50	0.51—0.90	0.91—1.30	0.10	0.11—0.3
	ЛК1	2.76—3.25	up to 0.50	0.51—0.90	0.91—1.30	0.10	0.11—0.3
	ЛК2	2.26—2.75	up to 0.50	0.51—0.90	0.91—1.30	0.10	0.11—0.3
	ЛК3	1.76—2.25	up to 0.50	0.51—0.90	0.91—1.30	0.10	0.11—0.3

IRON

composition, %								State standards
P			S			C	Cr, maximum	
Class			Group					
В	Г	Д	I	II	III			
mum								
Steel Making								
0.30	--	—	0.03	0.05	0.07		—	ГОСТ 805-57
0.30	—	—	0.03	0.05	0.07		—	
—	—	—	—	0.04	—		—	
—	—	—	—	0.06	—		—	
—	—	—	—	0.08	—		—	
—	—	—	0.03	0.04	—		—	ГОСТ 4831-49
—	—	—	0.03	0.04	—		—	
0.030	0.045	0.060	0.015	0.020	0.025		—	ГОСТ 805-57
0.030	0.045	0.060	0.015	0.020	0.025		—	
0.030	0.045	0.060	0.015	0.020	0.025		—	
0.026—0.030	0.031—0.045	0.046—0.060	0.015	0.020	0.025		—	ГОСТ 4831-49
0.026—0.030	0.031—0.045	0.046—0.060	0.015	0.020	0.025		—	
0.026—0.030	0.031—0.045	0.046—0.060	0.015	0.020	0.025		—	
Cast Iron								
0.31—0.70	0.71—1.20		0.02	0.03	0.04	3.5—4.0	—	ГОСТ 4832-58
0.31—0.70	0.71—1.20		0.02	0.03	0.04	3.6—4.1	—	
0.31—0.70	0.71—1.20		0.03	0.04	0.05	3.7—4.2	—	
0.31—0.70	0.71—1.20		0.03	0.04	0.05	3.8—4.3	—	

Type	Grade	Chemical					
		Si	Mn				
			Group				
			I	II	III	А	Б
						maxi	
Coke	ЛК4	1.26—1.75	up to 0.50	0.51—0.90	0.91—1.30	0.10	0.11—0.3
	ЛК5	0.75—1.25	up to 0.50	0.51—0.90	0.91—1.30	0.10	0.11—0.3
Charcoal	ЛД1	2.26—2.75	0.70—1.20			0.30	
	ЛД2	1.76—2.25	0.50—1.0			0.30	
	ЛД3	1.25—1.75	0.50—1.0			0.30	
Coke for malleable iron	КК	1.00—1.50	0.20—0.60			0.10	
Charcoal for malleable iron	КД1	0.71—1.5	0.1—0.4			0.15	
	КД2	0.15—0.7	0.1—0.3			0.15	
Coke for rolling mill rolls	ВК1	0.50—1.0	0.2—0.6			0.40	
	ВК2	0.1—0.5	0.2—0.6			0.40	
Charcoal for rolling mill rolls	ВД1	0.81—1.3	0.2—0.8			0.40	
	ВД2	0.3—0.8	0.2—0.8			0.40	
Coke for wheels with chilled rims	ЧК	0.5—1.0	0.5—1.0			0.20—0.35	
Coke for aviation industry	ЛКА	2.76—3.75	0.5—0.9			0.60—0.90	

Continued

composition, %								
P			S			C	Cr, maximum	State standards
Class			Group					
В	Г	Д	I	II	III			
mum								
0.31—0.70	0.71—1.20		0.04	0.05	0.06	3.9—4.4	—	ГОСТ 4832-58
0.31—0.70	0.71—1.20		0.05	0.06	0.07	4.0—4.5	—	
			0.02				—	ГОСТ 4833-49
			0.03				—	
			0.03				—	
			0.03				0.04	ГОСТ 4834-49
			0.03				0.04	
			0.03				0.04	
			0.03				0.04	
			0.03				0.04	
			0.06				0.04	
			0.06				0.04	
			0.07				0.10	
			0.025				—	

Name	Grade	Chemical							
		Si	Mn	C	Cr	W	Mo	V	Ti
					minimum				
Ferrosilicon (blast furnace)	Си15	≥13.1	≤3.0	—	—	—	—	—	—
	Си10	9—13	≤3.0	—	—	—	—	—	—
Spiegel	ЗЧ1	≤2.0	20.1—25	—	—	—	—	—	—
	ЗЧ2	≤2.0	15.1—20	—	—	—	—	—	—
	ЗЧ3	≤2.0	10—15	—	—	—	—	—	—
Ferromanganese (blast furnace)	Мн5 class A	≤2.0	≥75.1	—	—	—	—	—	—
	Мн5 class B	≤2.0	≥75.1	—	—	—	—	—	—
	Мн6 class A	≤2.0	70—75	—	—	—	—	—	—
	Мн6 class B	≤2.0	70—75		—	—	—	—	—
Ferrosilicon	Си90	87—95	≤0.5	—	≤0.2	—	—	—	—
	Си75	74—80	≤0.7	—	≤0.5	—	—	—	—
	Си45	40—47	≤0.8	—	≤0.5	—	—	—	—

ALLOYS

composition, %										State standard or specification No.
Ca	N	P	S	Al	Cu	Fe	Sb	As	Sn	
maximum										
—	—	0.20	0.04	—	—	—	—	—	—	ГОСТ 5163-49
—	—	0.20	0.04	—	—	—	—	—	—	
—	—	0.22	0.03	—	—	—	—	—	—	ГОСТ 5164-49
—	—	0.20	0.03	—	—	—	—	—	—	
—	—	0.18	0.03	—	—	—	—	—	—	
—	—	0.35	0.03	—	—	—	—	—	—	ГОСТ 5165-49
—	—	0.45	0.03	—	—	—	—	—	—	
—	—	0.35	0.03	—	—	—	—	—	—	
—	—	0.45	0.03	—	—	—	—	—	—	
—	—	0.04	0.04	—	—	—	—	—	—	ГОСТ 1415-49
—	—	0.05	0.04	—	—	—	—	—	—	
—	—	0.05	0.04	—	—	—	—	—	—	

Name	Grade	Chemical							
		Si	Mn	C	Cr	W	Mo	V	Ti
					minimum				
Silicomanganese	Симн 20	≥20	≥65	≤1.0	—	—	—	—	—
	Симн 17	17—19.9	≥65	≤1.7	—	—	—	—	—
	Симн 14	14—16.9	≥65	≤2.5	—	—	—	—	—
Ferromanganese, low carbon	Мн0	≤2.0	≥80	≤0.5	—	—	—	—	—
	Мн1	≤2.0	≥80	≤1.0	—	—	—	—	—
	Мн2	≤2.5	≥80	≤1.5	—	—	—	—	—
Ferromanganese, medium carbon	Мн3	≤2.0	≥78	≤7.0	—	—	—	—	—
	Мн4	≤2.0	≥76	≤7.0	—	—	—	—	—
Ferrochrome, carbon-free	Хр0000к	≤1; 1.5	-	0.03	65.0	—	—	—	—
	Хр0000к	≤1; 1.5	-	0.03—0.06	65.0	—	—	—	—
	Хр000	≤1; 1.5	-	0.07—0.10	65.0	-	—	—	—
	Хр00	≤1, 1.5	-	0.11—0.15	60.0	—	—	—	—
Ferrochrome, low carbon	Хр0	≤1.5; 2	-	0.16—0.25	60.0	—	—	—	—
	Хр01	≤1.5; 2	-	0.26—0.50	60.0	—	—	—	—

Continued

composition, %										State standard or specification No.
Ca	N	P	S	Al	Cu	Fe	Sb	As	Sn	
maximum										
—	—	0.1	—	—	—	—	—	—	—	ГОСТ 4756-49
—	—	0.1	—	—	—	—	—	—	—	
—	—	0.2	—	—	—	—	—	—	—	
—	—	0.30	0.03	—	—	—	—	—	—	ГОСТ 4755-49
—	—	0.30	0.03	—	—	—	—	—	—	
—	-	0.30	0.03	—	—	—	—	—	—	
—	—	0.33	0.03	—	—	—	—	—	—	ГОСТ 4755-49
—	—	0.38	0.03	—	—	—	—	—	—	
—	—	0.020	0.03	—	—	—	—	—	—	ТУ No. 301-60
—	—	0.030	0.03	—	—	—	—	—	—	
—	—	0.06	0.04	—	—	—	—	—	—	
—	—	0.06	0.04	—	—	—	—	—	—	
—	—	0.06	0.04	—	—	—	—	—	—	
—	—	0.06	0.04	—	—	—	—	—	—	

Name	Grade	Chemical							
		Si	Mn	C	Cr	W	Mo	V	Ti
					minimum				
Ferrochrome, medium carbon	Xp1	⩽1; 2	—	0.51—1.0	60.0	—	—	—	—
	Xp2	⩽1; 2	—	1.1—2.0	60.0	—	—	—	—
	Xp3	⩽1; 2	—	2.1—4.0	60.0	—	—	—	—
Ferrochrome, carbon	Xp4	⩽2; 3	—	4.1—6.0	65.0	—	—	—	—
	Xp6	⩽2; 3	—	6.1—8.0	65.0	—	—	—	—
Ferrotungsten	B0	⩽0.3	⩽0.2	⩽0.2	—	80	—	—	—
	B1	⩽0.4	⩽0.2	⩽0.2	—	70	—	—	—
	B2	⩽1.0	⩽0.4	⩽0.7	—	70	—	—	—
	B3	⩽1.5	⩽0.5	⩽0.8	—	65	—	—	—
Ferrotungsten containing molybdenum	B1a	⩽1.0	⩽0.3	⩽0.2	—	75	2.0—6.0	—	—
	B2a	⩽2.0	⩽0.5	⩽0.3	—	75	2.0—6.0	—	—
	B3a	⩽1.3	⩽0.5	⩽0.5	—	55	2.0—6.0	—	—

Continued

composition, %										State standard or specification No.
Ca	N	P	S	Al	Cu	Fe	Sb	As	Sn	
maximum										
—	—	0.04	0.04	—	—	—	—	—	—	ТУ No. 301-60
—	—	0.04	0.04	—	—	—	—	—	—	
—	—	0.04	0.04	—	—	—	—	—	—	
—	—	0.04	0.04	—	—	—	—	—	—	
—	—	0.04	0.04	—	—	—	—	—	—	
				Lead		Bismuth				
—	—	0.03	0.05	0.04	0.10	0.04	0.04	0.04	0.05	ГОСТ 4758-55
—	—	0.04	0.08	0.05	0.15	0.05	0.08	0.05	0.10	
—	—	0.05	0.10	—	0.20	—	—	0.08	0.15	
—	—	0.10	0.20	—	0.30	—	—	0.08	0.25	
—	—	0.04	0.04	1.0	0.25	—	—	0.05	0.10	ГОСТ 5199-50
—	—	0.05	0.08	2.0	0.30	—	—	0.08	0.15	
—	—	0.06	0.08	1.0	0.30	—	—	0.08	0.15	

Name	Grade	Chemical							
		Si	Mn	C	Cr	W	Mo	V	Ti
					minimum				
Ferromolybdenum	Mo1	≤1.0	—	≤0.10	—	—	55	—	—
	Mo2	≤1.5	—	≤0.15	—	—	55	—	—
	Mo3	≤2.0	—	≤0.20	—	—	55	—	—
Ferrovanadium	Вд1	≤2.0	—	≤0.75	—	—	—	35	—
	Вд2	≤3.0	—	≤0.75	—	—	—	35	—
	Вд3	≤3.5	—	≤1.0	—	—	—	35	—
Ferrotitanium	Ти0	—	—	≤0.15	—	—	—	—	25
	Ти1	—	—	≤0.15	—	—	—	—	23
	Ти2	—	—	≤0.20	—	—	—	—	23
		Ca + Si							
Silicocalcium	Каси0	≥90	—	—	—	—	—	—	—
	Каси1	≥90	—	—	—	—	—	—	—
	Каси2	≥85	—	—	—	—	—	—	—
Chromium metal	Х0	≤0.4	—	≤0.03	98.5	—	—	—	—
	Х1	≤0.5	—	≤0.05	98.0	—	—	—	—
	Х2	≤0.5	—	≤0.06	97.0	—	—	—	—

Continued

composition, %										State standard or specification No.
Ca	N	P	S	Al	Cu	Fe	Sb	As	Sn	
maximum										
—	—	0.10	0.10	—	0.8	—	0.05	—	0.05	ГОСТ 4759-49
—	—	0.15	0.15	—	1.5	—	0.08	—	0.08	
—	—	0.20	0.20	—	2.5	—	0.10	-	0.10	
—	—	0.10	0.10	1.0	—	—	—	0.05	—	ГОСТ 4760-49
—	—	0.20	0.10	1.5	—	—	—	0.05	—	
—	—	0.25	0.15	2.0	—	—	—	0.05	—	
								in proportion		
								Si : Ti	Al : Ti	
—	—	0.05	0.05	—	3.0	—	—	0.18	0.25	ГОСТ 4761-54
—	—	0.05	0.05	—	3.0	—	—	0.20	0.27	
—	—	0.08	0.08	—	4.0	—	—	0.28	0.40	
⩾31	—	0.05	0.04	1.5	—	—	—	—	—	ГОСТ 4762-49
⩾28	—	0.05	0.04	2.5	—	—	—	—	—	
⩾23	—	0.05	0.04	3.0	—	—	—	—	—	
—	—	0.02	0.02	0.5	0.06	0.6	—	—	—	ГОСТ 5905-51
—	—	0.03	0.04	0.7	0.06	0.8	—	—	—	
—	—	0.05	0.05	0.8	0.10	1.2	—	—	—	

Name	Grade	Chemical							
		Si	Mn	C	Cr	W	Mo	V	Ti
					minimum				
Manganese metal									
	Mp00	—	⩾99.95	⩽0.02	—	—	—	—	—
	Mp0	—	⩾99.70	⩽0.10	—	—	—	—	—
	Mp1	⩽0.8	⩾95.0	⩽0.10	—	—	—	—	—
	Mp2	⩽1.8	⩾93.0	⩽0.20	—	—	—	—	—
	Mp3	⩽3.5	⩾91.0	⩽0.12	—	—	—	—	—
	Mp4	⩽4.0	⩾88.0	⩽0.15	—	—	—	—	—

Continued

composition, %										State standard or specification No.
Ca	N	P	S	Al	Cu	Fe	Sb	As	Sn	
maximum										
—	—	0.005	0.01	—	—	—	—	—	total impurities 0.05	ГОСТ 6008-51
—	—	0.01	0.10	—	—	—	—	—	0.30	
—	—	0.05	—	—	—	2.5	—	—	5.0	
—	—	0.07	—	—	—	3.0	—	—	7.0	
—	—	0.45	—	1.0	2.5	2.0	—	—	9.0	
—	—	0.50	—	1.5	4.0	3.0	—	—	12.0	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
					Ordinary	
Open hearth	МСт. 0	⩽0.23	—	—	0.070	0.060
	МСт. 1 кп	0.06—0.12	0.05	0.25—0.50	0.045	0.055
	МСт. 2 кп	0.09—0.15	0.07	0.25—0.50	0.045	0.055
	МСт. 3 кп	0.14—0.22	0.07	0.30—0.60	0.045	0.055
	МСт. 3	0.14—0.22	0.12—0.30	0.40—0.65	0.045	0.055
	МСт. 4 кп	0.18—0.27	0.07	0.40—0.70	0.045	0.055
	МСт. 4	0.18—0.27	0.12—0.30	0.40—0.70	0.045	0.055
	МСт. 5	0.28—0.37	0.15—0.35	0.50—0.80	0.045	0.055
	МСт. 6	0.38—0.49	0.15—0.35	0.50—0.80	0.045	0.055
	МСт. 7	0.50—0.62	0.15—0.35	0.50—0.80	0.045	0.055
Bessemer	БСт. 0	⩽0.14	—	—	0.090	0.070
	БСт. 3 кп	0.12	0.07	0.25—0.55	0.080	0.060
	БСт. 3	0.12	0.12—0.35	0.25—0.55	0.080	0.060
	БСт. 4 кп	0.12—0.20	0.07	0.35—0.55	0.080	0.060
	БСт. 4	0.12—0.20	0.12—0.35	0.35—0.55	0.080	0.060
	БСт. 5	0.17—0.30	0.12—0.35	0.50—0.80	0.080	0.060
	БСт. 6	0.26—0.40	0.12—0.35	0.60—0.90	0.080	0.060

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
quality steel								
—	—	—	—	—	—	—	—	ГОСТ 380-60
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Steel for						
Open hearth	15 K	0.12–0.20	0.15–0.30	0.65	0.045	0.045
	20 K	0.16–0.24	0.15–0.30	0.65	0.045	0.045
	25 K	0.21–0.28	0.15–0.30	0.80	0.045	0.045
Locomotive boiler						
Open hearth	Ст. 3Т	0.12–0.22	—	—	0.04	0.04
	Ст. 3К	0.12–0.22	—	—	0.05	0.05
Steel for boilers of river						
	Ст. 3ТС	0.12–0.20	—	—	0.04	0.04
	Ст 4Т	⩽0.26	—	⩽0.60	0.04	0.04
	Ст. 5К	⩽0.30	—	—	0.05	0.05
Steel for						
	M16c	0.12–0.20	0.12–0.25	0.40–0.70	0.040	0.045
	Ст. 3мост	0.14–0.22	0.15–0.30	0.40–0.65	0.045	0.050
Steel for						
	14кп	⩽0.17	⩽0.03	⩽0.50	0.09	0.050
Steel, low carbon, for						
	Э, ЭА, ЭАА	⩽0.04	⩽0.20	⩽0.20	0.025	0.03

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
boilers								
—	—	—	—	—	—	—	—	ГОСТ 5520-50
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
and firebox steel								
—	—	—	—	—	—	—	—	ГОСТ 399-41
—	—	—	—	—	—	—	—	
and sea-going vessels								
—	—	—	—	—	—	—	—	ОСТ НКТП 4034
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
bridges								
—	—	—	—	—	—	—	—	ГОСТ 6713-53
—	—	—	—	—	—	—	—	
tin-plate								
—	—	—	—	—	—	—	—	ГОСТ 1127-57 and ГОСТ 5343-54
electrical manufacturing industry								
—	—	—	—	—	—	—	Cu $\leqslant 0.15$	ГОСТ 3836-47

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
						Steel for
Open hearth	Ст 1с кп	0.07—0.12	Traces	0.35—0.50	0.05	0.05
	Ст. 2с кп	0.09—0.15	Traces	0.35—0.50	0.05	0.05
	Ст. 3с	0.14—0.22	0.12—0.35	0.35—0.60	0.05	0.05
	Ст. 3с кп	0.14—0.22	Traces	0.35—0.60	0.05	0.05
	Ст. 4с	0.18—0.27	0.12—0.35	0.40—0.70	0.05	0.05
	Ст. 4с кп	0.18—0.27	Traces	0.40—0.70	0.05	0.05
	Ст. 4л	0.18—0.27	0.12—0.35	0.70	0.05	0.05
	Ст. 4ф	0.18—0.27	0.12—0.35	0.40—0.70	0.05	0.05
	Ст. 4 фкп	0.18—0.27	Traces	0.40—0.70	0.05	0.05
	Ст. 5с пов.	0.28—0.32	0.17—0.35	⩽0.8	0.05	0.05
	Ст. 5с	0.28—0.35	0.17—0.35	⩽0.8	0.05	0.05
						Steel for
Bessemer	НБ-62	0.50—0.73	0.15—0.30	0.6—1.0	0.075	0.06
						Steel for
Open hearth	М71	0.64—0.77	0.13—0.28	0.6—0.9	0.040	0.050
	М75	0.67—0.80	0.13—0.28	0.7—1.0	0.040	0.050
	М76	0.69—0.82	0.13—0.28	0.7—1.0	0.040	0.050

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
ship-building								
—	—	—	—	—	—	—	—	ГОСТ 5521-50
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
crane rails								
—	—	—	—	—	—	—	—	ГОСТ 4121-52
railway rails								
—	—	—	—	—	—	—	—	ГОСТ 4224-54
—	—	—	—	—	—	—	—	ГОСТ 6944-54
—	—	—	—	—	—	—	—	ГОСТ 8160-56

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Bessemer	НБ57	0.48—0.67	0.15—0.30	0.6—1.0	0.070	0.060
	НБ61	0.53—0.70	0.15—0.30	0.5—1.0	0.070	0.060
		Steel for				
Open hearth		0.40—0.55	0.15—0.35	1.2—1.6	0.04	0.04
	M75	0.67—0.80	0.13—0.28	0.7—1.0	0.04	0.04
		Structural				
Quality carbon steel **With normal Mn content**	05кп	⩽0.06	⩽0.03	⩽0.04	0.035	0.040
	08кп	0.05—0.11	⩽0.03	0.25—0.50	0.040	0.040
	08	0.05—0.12	0.17—0.37	0.35—0.65	0.035	0.040
	10кп	0.07—0.14	⩽0.07	0.25—0.50	0.040	0.040
	10	0.07—0.14	0.17—0.37	0.35—0.65	0.035	0.040
	15кп	0.12—0.19	⩽0.07	0.25—0.50	0.040	0.040
	15	0.12—0.19	0.17—0.37	0.35—0.65	0.040	0.040
	20кп	0.17—0.24	⩽0.07	0.25—0.50	0.040	0.040
	20	0.17—0.24	0.17—0.37	0.35—0.65	0.040	0.040
	25	0.22—0.30	0.17—0.37	0.50—0.80	0.040	0.040
	30	0.27—0.35	0.17—0.37	0.50—0.80	0.040	0.040
	35	0.32—0.40	0.17—0.37	0.50—0.80	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
—	—	—	—	—	—	—	—	ГОСТ 5633-51
—	—	—	—	—	—	—	—	
tram rails								
—	—	—	—	—	—	—	—	ГОСТ 6544-53
—	—	—	—	—	—	—	—	
steel								
0.10	0.25	—	—	—	—	—	—	ГОСТ 1050-60
0.10	0.25	—	—	—	—	—	—	
0.10	0.25	—	—	—	—	—	—	
0.15	0.25	—	—	—	—	—	—	
0.15	0.25	—	—	—	—	—	—	
0.25	0 25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
With normal Mn content	40	0.37–0.45	0.17–0.37	0.50–0.80	0.040	0.040
	45	0.42–0.50	0.17–0.37	0.50–0.80	0.040	0.040
	50	0.47–0.55	0.17–0.37	0.50–0.80	0.040	0.040
	55	0.52–0.60	0.17–0.37	0.50–0.80	0.040	0.040
	60	0.57–0.65	0.17–0.37	0.50–0.80	0.040	0.040
	65	0.62–0.70	0.17–0.37	0.50–0.80	0.040	0.040
	70	0.67–0.75	0.17–0.37	0.50–0.80	0.040	0.040
	75	0.72–0.80	0.17–0.37	0.50–0.80	0.040	0.040
	80	0.77–0.85	0.17–0.37	0.50–0.80	0.040	0.040
	85	0.82–0.90	0.17–0.37	0.50–0.80	0.040	0.040
With increased Mn content	15Г	0.12–0.19	0.17–0.37	0.70–1.00	0.040	0.040
	20Г	0.17–0.24	0.17–0.37	0.70–1.00	0.040	0.040
	25Г	0.22–0.30	0.17–0.37	0.70–1.00	0.040	0.040
	30Г	0.27–0.35	0.17–0.37	0.70–1.00	0.040	0.040
	35Г	0.32–0.40	0.17–0.37	0.70–1.00	0.040	0.040
	40Г	0.37–0.45	0.17–0.37	0.70–1.00	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.25	0.25	—	—	—	—	—	—	ГОСТ 1050-60
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
With increased Mn content	45Г	0.42—0.50	0.17—0.37	0.70—1.00	0.040	0.040
	50Г	0.48—0.56	0.17—0.37	0.70—1.00	0.040	0.040
	60Г	0.57—0.65	0.17—0.37	0.70—1.00	0.040	0.040
	65Г	0.62—0.70	0.17—0.37	0.90—1.20	0.040	0.040
	70Г	0.67—0.75	0.17—0.37	0.90—1.20	0.040	0.040
Low Alloy Silico-manganese	15ГС	0.12—0.18	0.70—1.00	0.90—1.30	0.040	0.040
	18Г2С	0.14—0.23	0.60—0.90	1.20—1.60	0.050	0.050
	25Г2С (25ГС)	0.20—0.29	0.60—0.90	1.20—1.60	0.050	0.050
Silico-manganese-copper	10Г2СД (МК)	⩽0.12	0.80—1.10	1.30—1.65	0.040	0.040
Chrome-silico-manganese	14ХГС	0.11—0.17	0.40—0.70	0.90—1.30	0.040	0.040
	30ХГ2С	0.26—0.35	0.60—0.90	1.20—1.60	0.050	0.050
Chrome-silico-manganese-nickel	14ХГСН	0.11—0.17	0.40—0.70	0.90—1.30	0.040	0.040
	10ХГ2СН	⩽0.12	0.50—0.80	1.20—1.60	0.040	0.040
Chrome-silico-manganese-nickel-copper	10ХГСНД (МС-1)	⩽0.12	0.80—1.10	0.80—1.20	0.040	0.040
Chrome-silico-nickel-copper	10ХСНД (СХЛ-4)	⩽0.12	0.80—1.10	0.50—0.80	0.040	0.040
	15ХСНД (СХЛ-1, НЛ-2)	0.12—0.18	0.40—0.70	0.40—0.70	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.25	0.25	—	—	—	—	—	—	ГОСТ 1050-60
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
0.25	0.25	—	—	—	—	—	—	
≤0.30	≤0.30	—	—	—	—	—	Cu ≤0.30	ГОСТ 5058-57
≤0.30	≤0.30	—	—	—	—	—	≤0.30	
≤0.30	≤0.30	—	—	—	—	—	≤0.30	
≤0.30	≤0.30	—	—	—	—	—	Cu 0.15—0.30	
0.50—0.80	≤0.30	—	—	—	—	—	≤0.30	
0.60—0.90	≤0.30	—	—	—	—	—	≤0.30	
0.20—0.60	0.80—1.30	—	—	—	—	—	≤0.30	
0.20—0.60	0.80—1.30	—	—	—	—	—	≤0.30	
0.30—0.50	1.00—1.30	—	—	—	—	—	0.30—0.50	
0.60—0.90	0.50—0.80	—	—	—	—	—	0.40—0.65	
0.60—0.90	0.30—0.60	—	—	—	—	—	0.20—0.40	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-manganese	12ХГ (БНЛ-2)	⩽0.14	0.25—0.50	0.40—0.80	0.050	0.050
Chrome-manganese-nickel	12ХГН	⩽0.14	0.20—0.40	0.90—1.30	0.040	0.040
	10ХГ2Н	⩽0.12	0.20—0.40	1.20—1.60	0.040	0.040
	14ХГ2Н	0.11—0.17	0.20—0.40	1.30—1.70	0.040	0.040
	15ХГН	0.12—0.18	0.20—0.40	0.90—1.30	0.040	0.040
Manganese	14Г	0.12—0.18	0.20—0.40	0.70—1.00	0.040	0.040
Manganese	19Г	0.16—0.22	0.20—0.40	0.70—1.00	0.040	0.040
	24Г	0.21—0.28	0.20—0.40	0.70—1.00	0.040	0.040
	09Г2	⩽0.12	0.20—0.40	1.40—1.80	0.040	0.040
	14Г2	0.12—0.18	0.20—0.40	1.20—1.60	0.040	0.040
Manganese-nickel-copper	10ГНД	⩽0.12	0.20—0.40	0.90—1.30	0.040	0.040
	14ГНД	0.11—0.17	0.20—0.40	0.90—1.30	0.040	0.040
Chrome-nickel-copper-phosphorus	10ХНДП	⩽0.12	0.20—0.40	0.30—0.60	0.08—0.15	0.040
Quality alloy steel	15Х	0.12—0.20	0.17—0.37	0.30—0.60	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.40—0.70	⩽0.30	—	—	—	—	—	⩽0.30	ГОСТ 5058-57
0.20—0.60	0.80—1.30	—	—	—	—	—	⩽0.30	
0.20—0.60	0.80—1.30	—	—	—	—	—	⩽0.30	
0.20—0.60	0.80—1.30	—	—	—	—	—	⩽0.30	
0.20—0.60	0.80—1.30	—	—	—	—	—	⩽0.30	
⩽0.30	⩽0.30	—	—	—	—	—	⩽0.30	
⩽0.30	⩽0.30	—	—	—	—	—	⩽0.30	
⩽0.30	⩽0.30	—	—	—	—	—	⩽0.30	
⩽0.30	⩽0.30	—	—	—	—	—	⩽0.30	
⩽0.30	⩽0.30	—	—	—	—	—	⩽0.30	
0.20—0.60	0.80—1.30	—	—	—	—	—	0.50—0.80	
0.20—0.60	0.80—1.30	—	—	—	—	—	0.50—0.80	
0.50—0.80	0.30—0.60	—	—	—	—	—	0.30—0.50	
0.70—1.00	⩽0.40	—	—	—	—	—	—	ГОСТ 4543-48

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome	20X	0.15—0.25	0.17—0.37	0.50—0.60	0.040	0.040
	30X	0.25—0.35	0.17—0.37	0.50—0.80	0.040	0.040
	35X	0.30—0.40	0.17—0.37	0.50—0.80	0.040	0.040
	40X	0.35—0.45	0.17—0.37	0.50—0.80	0.040	0.040
	45X	0.40—0.50	0.17—0.37	0.50—0.80	0.040	0.040
	50X	0.45—0.55	0.17—0.37	0.50—0.80	0.040	0.040
Chrome-vanadium	15XΦ	0.12—0.20	0.17—0.37	0.30—0.60	0.040	0.040
	20XΦ	0.15—0.25	0.17—0.37	0.40—0.70	0.040	0.040
Molybdenum	15M	0.10—0.18	0.17—0.37	0.40—0.70	0.040	0.040
	20M	0.15—0.25	0.17—0.37	0.40—0.70	0.040	0.040
	30M	0.25—0.35	0.17—0.37	0.50—0.80	0.040	0.040
Chrome-molybdenum	12XM	⩽0.16	0.17—0.37	0.40—0.70	0.040	0.040
	20XM	0.15—0.25	0.17—0.37	0.40—0.70	0.040	0.040
	30XM	0.25—0.35	0.17—0.37	0.40—0.70	0.040	0.040
	35XM	0.30—0.40	0.17—0.37	0.40—0.70	0.040	0.040
Chrome-silicon	33XC	0.29—0.37	1.00—1.30	0.30—0.60	0.040	0.040
	37XC (40XC)	0.32—0.42	1.00—1.30	0.30—0.60	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.70—1.00	≤0.40	—	—	—	—	—	—	ГОСТ 4543-48
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	0.1—0.2	—	—	—	
0.80—1.10	≤0.40	—	—	0.1—0.2	—	—	—	
≤0.30	≤0.30	—	0.40—0.55	—	—	—	—	
≤0.30	≤0.30	—	0.40—0.55	—	—	—	—	
≤0.30	≤0.40	—	0.40—0.55	—	—	—	—	
0.80—1.10	≤0.030	—	0.40—0.55	—	—	—	—	
0.80—1.10	≤0.040	—	0.15—0.25	—	—	—	—	
0.80—1.10	≤0.040	—	0.15—0.25	—	—	—	—	
0.80—1.10	≤0.040	—	0.15—0.25	—	—	—	—	
1.30—1.60	≤0.40	—	—	—	—	—	—	
1.30—1.60	≤0.40	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-silicon	40ХС	0.37—0.45	1.20—1.60	0.30—0.60	0.040	0.040
Chrome-manganese	15ХГ	0.12—0.20	0.17—0.37	1.10—1.40	0.040	0.040
	20ХГ	0.15—0.25	0.17—0.37	0.90—1.20	0.040	0.040
	40ХГ	0.35—0.45	0.17—0.37	0.90—1.20	0.040	0.040
	35ХГ2	0.30—0.40	0.17—0.37	1.60—1.90	0.040	0.040
Ditto with titanium	18ХГТ	0.16—0.24	0.17—0.37	0.80—1.10	0.040	0.040
Chrome-manganese-molybdenum	18ХГМ	0.16—0.24	0.17—0.37	0.90—1.20	0.040	0.040
	40ХГМ (38ХГМ)	0.37—0.45	0.17—0.37	0.90—1.20	0.040	0.040
Silico-manganese	27СГ	0.22—0.32	1.10—1.40	1.10—1.40	0.040	0.040
	35СГ	0.30—0.40	1.10—1.40	1.10—1.40	0.040	0.040
Chrome-silico-manganese	20ХГС	0.15—0.25	0.90—1.20	0.80—1.10	0.040	0.040
	25ХГС	0.22—0.30	0.90—1.20	0.80—1.10	0.040	0.040
	30ХГС	0.25—0.35	0.90—1.20	0.80—1.10	0.040	0.040
	35ХГС	0.30—0.40	1.10—1.40	0.80—1.10	0.040	0.040
Nickel	25Н	0.20—0.30	0.17—0.37	0.50—0.80	0.040	0.040
	30Н	0.25—0.35	0.17—0.37	0.50—0.80	0.040	0.040

Continued

composition, %								
Cr	Ni	W	Mo	V	Ti	Al	Other elements	State standards
1.30—1.60	≤0.40	—	—	—	—	—	—	ГОСТ 4543-48
0.40—0.70	≤0.40	—	—	—	—	—	—	
0.90—1.20	≤0.40	—	—	—	—	—	—	
0.90—1.20	≤0.40	—	—	—	—	—	—	
0.40—0.70	≤0.40	—	—	—	—	—	—	
1.00—1.30	≤0.40	—	—	—	0.08—0.15	—	—	
0.90—1.20	≤0.40	—	0.20—0.30	—	—	—	—	
0.90—1.20	≤0.40	—	0.20—0.30	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
≤0.30	0.50—0.90	—	—	—	—	—	—	
≤0.30	0.80—1.20	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Nickel-molybdenum	15HM	0.10—0.18—	0.17—0.37	0.40—0.70	0.040	0.040
	20HM	0.17—0.25	0.17—0.37	0.40—0.70	0.040	0.040
	40HM	0.37—0.45	0.17—0.37	0.50—0.80	0.040	0.040
Chrome-nickel	20XH	0.15—0.25	0.17—0.37	0.40—0.70	0.040	0.040
	40XH	0.35—0.45	0.17—0.37	0.50—0.80	0.040	0.040
	45XH	0.40—0.50	0.17—0.37	0.50—0.80	0.040	0.040
	50XH	0.45—0.55	0.17—0.37	0.50—0.80	0.040	0.040
	12XH2	⩽0.17	0.17—0.37	0.30—0.60	0.040	0.040
	12XH3	⩽0.17	0.17—0.37	0.30—0.60	0.040	0.040
	30XH3	0.25—0.35	0.17—0.37	0.30—0.60	0.040	0.040
	12X2H4	⩽0.17	0.17—0.37	0.30—0.60	0.040	0.040
	20X2H4	0.15—0.22	0.17—0.37	0.30—0.60	0.040	0.040
High-quality alloy steel						
Chrome	15XA	0.12—0.18	0.17—0.37	0.30—0.60	0.040	0.040
	20XA	0.17—0.24	0.17—0.37	0.50—0.80	0.040	0.040
	30XA	0.25—0.33	0.17—0.37	0.50—0.80	0.040	0.040
	38XA	0.34—0.42	0.17—0.37	0.50—0.80	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
≤0.30	1.50— 2.00	—	0.20— 0.30	—	—	—	—	ГОСТ 4543-48
≤0.30	1.50— 2.00	—	0.20— 0.30	—	—	—	—	
≤0.30	1.50— 2.00	—	0.20— 0.30	—	—	—	—	
0.45— 0.75	1.00— 1.50	—	—	—	—	—	—	
0.45— 0.75	1.00— 1.50	—	—	—	—	—	—	
0.45— 0.75	1.00— 1.50	—	—	—	—	—	—	
0.45— 0.75	1.00— 1.50	—	—	—	—	—	—	
0.60— 0.90	1.50— 2.00	—	—	—	—	—	—	
0.60— 0.90	2.75— 3.25	—	—	—	—	—	—	
0.60— 0.90	2.75— 3.25	—	—	—	—	—	—	
1.25— 1.75	3.25— 3.75	—	—	—	—	—	—	
1.25— 1.75	3.25— 3.75	—	—	—	—	—	—	
0.70— 1.00	≤0.40	—	—	—	—	—	—	
0.70— 1.00	≤0.40	—	—	—	—	—	—	
0.80— 1.10	≤0.40	—	—	—	—	—	—	
0.80— 1.10	≤0.40	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome	45XA	0.42—0.50	0.17—0.37	0.50—0.80	0.040	0.040
	50XA	0.47—0.55	0.17—0.37	0.50—0.80	0.040	0.040
Chrome-vanadium	15XΦA	0.12—0.18	0.17—0.37	0.30—0.60	0.040	0.040
	20XΦA	0.17—0.25	0.17—0.37	0.40—0.70	0.040	0.040
	40XΦA	0.37—0.45	0.17—0.37	0.50—0.80	0.040	0.040
	50XΦA	0.46—0.54	0.17—0.37	0.50—0.80	0.040	0.040
Molybdenum	12MA	0.10—0.16	0.17—0.37	0.40—0.70	0.040	0.040
	20MA	0.17—0.24	0.17—0.37	0.40—0.70	0.040	0.040
	30MA	0.26—0.34	0.17—0.37	0.50—0.80	0.040	0.040
Chrome-molybdenum	15XMA	0.10—0.18	0.17—0.37	0.40—0.70	0.040	0.040
	20XMA	0.17—0.24	0.17—0.37	0.40—0.70	0.040	0.040
	30XMA	0.25—0.33	0.17—0.37	0.40—0.70	0.040	0.040
	35XMA	0.32—0.40	0.17—0.37	0.40—0.70	0.040	0.040
	35X2MA	0.32—0.40	0.17—0.37	0.40—0.70	0.040	0.040
Chrome-silicon	33XCA	0.29—0.37	1.00—1.30	0.30—0.60	0.040	0.040
	40XCA	0.37—0.45	1.00—1.30	0.30—0.60	0.040	0.040

Continued

composition, %								
Cr	Ni	W	Mo	V	Ti	Al	Other elements	State standards
0.80–1.10	≤0.40	—	—	—	—	—	—	ГОСТ 4543-48
0.80–1.10	≤0.40	—	—	—	—	—	—	
0.80–1.10	≤0.40	—	—	0.10–0.20	—	—	—	
0.80–1.10	≤0.40	—	—	0.10–0.20	—	—	—	
0.80–1.10	≤0.40	—	—	0.10–0.20	—	—	—	
0.80–1.10	≤0.40	—	—	0.10–0.20	—	—	—	
≤0.30	≤0.30	—	0.40–0.55	—	—	—	—	
≤0.30	≤0.30	—	0.40–0.55	—	—	—	—	
≤0.30	≤0.40	—	0.40–0.55	—	—	—	—	
0.80–1.10	≤0.30	—	0.40–0.55	—	—	—	—	
0.80–1.10	≤0.40	—	0.15–0.25	—	—	—	—	
0.80–1.10	≤0.40	—	0.15–0.25	—	—	—	—	
0.80–1.10	≤0.40	—	0.15–0.25	—	—	—	—	
1.60–1.90	≤0.40	—	0.15–0.25	—	—	—	—	
1.30–1.60	≤0.40	—	—	—	—	—	—	
1.30–1.60	≤0.40	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-manganese	15ХГА	0.12— 0.18	0.17— 0.37	1.10— 1.40	0.040	0.040
	20ХГА	0.18— 0.25	0.17— 0.37	0.90— 1.20	0.040	0.040
	40ХГА	0.37— 0.45	0.17— 0.37	0.90— 1.20	0.040	0.040
	35ХГ2А	0.32— 0.40	0.17— 0.37	1.60— 1.90	0.040	0.040
Chrome-manganese-molybdenum	18ХГМА	0.16— 0.24	0.17— 0.37	0.90— 1.20	0.040	0.040
	40ХГМА	0.37— 0.45	0.17— 0.37	0.90— 1.20	0.040	0.040
Chrome-silico-manganese	20ХГСА	0.17— 0.24	0.90— 1.20	0.80— 1.10	0.040	0.040
	20ХГСА	0.22— 0.29	0.90— 1.20	0.80— 1.10	0.040	0.040
	30ХГСА	0.28— 0.35	0.90— 1.20	0.80— 1.10	0.040	0.040
	35ХГСА	0.32— 0.39	1.10— 1.40	0.80— 1.10	0.040	0.040
Chrome-aluminium and chrome-molybdenum-aluminium	35ХЮА	0.31— 0.39	0.17— 0.37	0.30— 0.60	0.040	0.040
	38ХМЮА	0.35— 0.43	0.17— 0.37	0.30— 0.60	0.040	0.040
Chrome-molybdenum-vanadium	35ХМФА	0.30— 0.38	0.17— 0.37	0.40— 0.70	0.040	0.040
	25Х2МФА	0.22— 0.29	0.17— 0.37	0.40— 0.70	0.040	0.040
Nickel	25НА	0.22— 0.30	0.17— 0.37	0.50— 0.80	0.040	0.040
	30НА	0.27— 0.35	0.17— 0.37	0.50— 0.80	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.40—0.70	≤0.40	—	—	—	—	—	—	ГОСТ 4543-48
0.90—1.20	≤0.40	—	—	—	—	—	—	
0.90—1.20	≤0.40	—	—	—	—	—	—	
0.40—0.70	≤0.40	—	—	—	—	—	—	
0.90—1.20	≤0.40	—	0.20—0.30	—	—	—	—	
0.90—1.20	≤0.40	—	0.20—0.30	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	—	—	—	—	
1.10—1.40	≤0.40	—	—	—	—	—	—	
1.35—1.65	≤0.40	—	—	—	—	0.70—1.20	—	
1.35—1.65	≤0.40	—	0.15—0.25	—	—	0.70—1.10	—	
1.00—1.30	≤0.40	—	0.20—0.30	0.10—0.20	—	—	—	
1.50—1.80	≤0.40	—	0.20—0.30	0.15—0.30	—	—	—	
≤0.30	0.50—0.90	—	—	—	—	—	—	
≤0.30	0.80—1.20	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Nickel-molybdenum	15HMA	< 0.17	0.17—0.37	0.40—0.70	0.040	0.040
	40HMA	0.37—0.45	0.17—0.37	0.50—0.80	0.040	0.040
Chrome-nickel	20XHA	0.15—0.23	0.17—0.37	0.40—0.70	0.040	0.040
	40XHA	0.37—0.45	0.17—0.37	0.50—0.80	0.040	0.040
	12XH2A	0.11—0.17	0.17—0.37	0.30—0.60	0.040	0.040
	12XH3A	0.11—0.17	0.17—0.37	0.30—0.60	0.040	0.040
	20XH3A	0.17—0.25	0.17—0.37	0.30—0.60	0.040	0.040
	30XH3A	0.27—0.35	0.17—0.37	0.30—0.60	0.040	0.040
	37XH3A	0.33—0.41	0.17—0.37	0.25—0.55	0.040	0.040
	12X2H4A	0.11—0.17	0.17—0.37	0.30—0.60	0.040	0.040
	20X2H4A	0.15—0.22	0.17—0.37	0.30—0.60	0.040	0.040
Chrome-nickel-vanadium	20XH4ΦA	0.17—0.24	0.17—0.37	0.25—0.55	0.040	0.040
Chrome-nickel-tungsten	18XHBA	0.14—0.21	0.17—0.37	0.25—0.55	0.040	0.040
	25XHBA	0.21—0.28	0.17—0.37	0.25—0.55	0.040	0.040
Chrome-nickel-molybdenum	12X2H3MA	0.10—0.17	0.17—0.37	0.30—0.60	0.040	0.040
	18X2H4MA	0.15—0.22	0.17—0.37	0.40—0.70	0.040	0.040
	33XH3MA	0.29—0.37	0.17—0.37	0.50—0.80	0.040	0.040

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
≤0.30	1.50– 2.00	—	0.20– 0.30	—	—	—	—	ГОСТ 4543-48
≤0.30	1.50– 2.00	—	0.20– 0.30	—	—	—	—	
0.45– 0.75	1.00– 1.50	—	—	—	—	—	—	
0.45– 0.75	1.00– 1.50	—	—	—	—	—	—	
0.60– 0.90	1.50– 2.00	—	—	—	—	—	—	
0.60– 0.90	2.75– 3.25	—	—	—	—	—	—	
0.60– 0.90	2.75– 3.25	—	—	—	—	—	—	
0.60– 0.90	2.75– 3.25	—	—	—	—	—	—	
1.20– 1.60	3.00– 3.50	—	—	—	—	—	—	
1.25– 1.75	3.25– 3.75	—	—	—	—	—	—	
1.25– 1.75	3.25– 3.75	—	—	—	—	—	—	
0.70– 1.10	3.75– 4.25	—	—	0.15– 0.30	—	—	—	
1.35– 1.65	4.00– 4.50	0.80– 1.2	—	—	—	—	—	
1.35– 1.65	4.00– 4.50	0.80– 1.2	—	—	—	—	—	
1.45– 1.75	2.75– 3.25	—	0.20– 0.30	—	—	—	—	
1.45– 1.75	3.25– 3.75	—	0.20– 0.30	—	—	—	—	
0.80– 1.10	2.50– 3.00	—	0.20– 0.30	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-nickel-molybdenum	40ХНМА	0.36–0.44	0.17–0.37	0.50–0.80	0.040	0.040
Chrome-nickel-molybdenum-vanadium	30ХН2МФА	0.26–0.33	0.17–0.37	0.30–0.60	0.040	0.040
	45ХНМФА	0.42–0.50	0.17–0.37	0.50–0.80	0.040	0.040
		Steel for ball				
Chrome	ШХ6	1.05–1.15	0.15–0.35	0.2–0.4	0.027	0.02
	ШХ9	1.0–1.1	0.15–0.35	0.2–0.4	0.027	0.02
	ШХ15	0.95–1.1	0.15–0.35	0.2–0.4	0.027	0.02
	ШХ15СГ	0.95–1.1	0.4–0.65	0.9–1.2	0.027	0.02
		Free-cutting				
	А12	0.08–0.16	0.15–0.35	0.60–0.90	0.08–0.15	0.08–0.20
	А20	0.15–0.25	0.15–0.35	0.60–0.90	⩽0.06	0.08–0.15
	А30	0.25–0.35	0.15–0.35	0.70–1.0	⩽0.06	0.08–0.15
	А40Г	0.35–0.45	0.15–0.35	1.20–1.55	⩽0.05	0.18–0.30
		Spring				
Carbon	75	0.72–0.80	0.17–0.37	0.50–0.80	0.04	0.045
	85	0.82–0.90	0.17–0.37	0.50–0.80	0.04	0.045

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.60—0.90	1.25—1.75	—	0.15—0.25	—	—	—	—	ГОСТ 4543-48
0.60—0.90	2.00—2.50	—	0.20—0.30	0.15—0.30	—	—	—	
0.80—1.10	1.30—1.80	—	0.20—0.30	0.10—0.20	—	—	—	
and roller bearings								
							Cu Ni+Cu	
0.4—0.7	0.3	—	—	—	—	—	0.25 0.5	ГОСТ 801-60
0.9—1.2	0.3	—	—	—	—	—	0.25 0.5	
1.3—1.65	0.3	—	—	—	—	—	0.25 0.5	
1.3—1.65	0.3	—	—	—	—	—	0.25 0.5	
steel								
—	—	—	—	—	—	—	—	ГОСТ 1414-54
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	
steel								
⩽0.30	⩽0.30	—	—	—	—	—	—	ГОСТ 2052-53
⩽0.30	⩽0.30	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Manganese	55ГС	0.52– 0.60	0.50– 0.80	0.60– 0.90	0.04	0.045
Silicon	50С2	0.47– 0.55	1.50– 2.00	0.60– 0.90	0.04	0.04
	55С2	0.52– 0.60	1.50– 2.00	0.60– 0.90	0.04	0.04
	60С2	0.57– 0.65	1.50– 2.00	0.60– 0.90	0.04	0.04
	60С2А	0.56– 0.64	1.60– 2.00	0.60– 0.90	0.03	0.03
	70С3А	0.66– 0.74	2.40– 2.80	0.60– 0.90	0.035	0.03
	63С2А	0.60– 0.65	1.80– 2.20	0.60– 0.90	0.03	0.03
Chrome-manganese	50ХГ	0.46– 0.54	0.17– 0.37	0.70– 1.00	0.04	0.04
	50ХГА	0.46– 0.54	0.17– 0.37	0.80– 1.00	0.03	0.03
Chrome-vanadium	50ХФА	0.46– 0.54	0.17– 0.37	0.50– 0.80	0.035	0.03
Chrome-manganese-vanadium	50ХГФА	0.48– 0.55	0.17– 0.37	0.80– 1.00	0.03	0.03
Chrome-silico-vanadium	60С2ХФА	0.56– 0.64	1.40– 1.80	0.40– 0.70	0.035	0.03
Chrome-silicon	60С2ХА	0.56– 0.64	1.40– 1.80	0.40– 0.70	0.035	0.03
Tungsten-silicon	65С2ВА	0.61– 0.69	1.50– 2.00	0.70– 1.00	0.035	0.03
Nickel-silicon	60С2Н2А	0.56– 0.64	1.40– 1.80	0.40– 0.70	0.035	0.03

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
≤0.30	≤0.40	—	—	—	—	—	—	ГОСТ 2052-53
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
0.90—1.20	≤0.40	—	—	—	—	—	—	
0.95—1.20	≤0.40	—	—	—	—	—	—	
0.80—1.10	≤0.40	—	—	0.10—0.20	—	—	—	
0.95—1.20	≤0.40	—	—	0.15—0.25	—	—	—	
0.90—1.20	≤0.40	—	—	0.10—0.20	—	—	—	
0.70—1.00	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	0.80—1.20	—	—	—	—	—	
≤0.30	1.40—1.70	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Silico-manganese	55СГ	0.50—0.60	1.30—1.80	0.80—1.00	0.040	0.04
	60СГ	0.55—0.65	1.30—1.80	0.80—1.00	0.040	0.04
	60СГА	0.56—0.64	1.30—1.80	0.80—1.00	0.030	0.03
Silico-chrome	70С2ХА	0.65—0.75	1.40—1.70	0.40—0.60	0.030	0.03
		Tool				
Quality carbon	У7	0.65—0.74	0.15—0.35	0.20—0.40	0.035	0.030
	У8	0.75—0.84	0.15—0.35	0.20—0.40	0.035	0.030
	У8Г	0.80—0.90	0.15—0.35	0.35—0.60	0.035	0.030
	У9	0.85—0.94	0.15—0.35	0.15—0.35	0.035	0.030
	У10	0.95—1.04	0.15—0.35	0.15—0.35	0.035	0.030
	У11	1.05—1.14	0.15—0.35	0.15—0.35	0.035	0.030
	У12	1.15—1.24	0.15—0.35	0.15—0.35	0.035	0.030
	У13	1.25—1.35	0.15—0.35	0.15—0.35	0.035	0.030
	У7А	0.65—0.74	0.15—0.30	0.15—0.30	0.030	0.020
	У8А	0.75—0.84	0.15—0.30	0.15—0.30	0.030	0.020
	У8ГА	0.80—0.90	0.35—0.60	0.35—0.60	0.030	0.020
	У9А	0.85—0.94	0.15—0.30	0.15—0.30	0.030	0.020

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
≤0.30	≤0.40	—	—	—	—	—	—	ГОСТ 2052-53
≤0.30	≤0.40	—	—	—	—	—	—	
≤0.30	≤0.40	—	—	—	—	—	—	
0.20—0.40	≤0.30	—	—	—	—	—	—	
steel								
0.20	0.25	—	—	—	—	—	Cu 0.20	ГОСТ 1435-54
0.20	0.25	—	—	—	—	—	0.20	
0.20	0.25	—	—	—	—	—	0.20	
0.20	0.25	—	—	—	—	—	0.20	
0.20	0.25	—	—	—	—	—	0.20	
0.20	0.25	—	—	—	—	—	0.20	
0.20	0.25	—	—	—	—	—	0 20	
0.20	0.25	—	—	—	—	—	0.20	
0.15	0.20	—	—	—	—	—	0.20	
0.15	0.20	—	—	—	—	—	0.20	
0.15	0.20	—	—	—	—	—	0.20	
0.15	0.20	—	—	—	—	—	0.20	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
High-quality carbon steel	У10А	0.95–1.04	0.15–0.30	0.15–0.30	0.030	0.020
	У11А	1.05–1.14	0.15–0.30	0.15–0.30	0.030	0.020
	У12А	1.15–1.24	0.15–0.30	0.15–0.30	0.030	0.020
	У13А	1.25–1.35	0.15–0.30	0.15–0.30	0.030	0.020
Alloy steel						
Chrome	Х12	2.00–2.30	≤0.40	≤0.35	0.030	0.030
	Х12М	1.45–1.70	≤0.40	≤0.35	0.030	0.030
	ХГ	1.30–1.50	≤0.35	0.45–0.70	0.030	0.030
	Х	0.95–1.10	≤0.35	≤0.40	0.030	0.030
	Х09	0.95–1.10	≤0.35	≤0.40	0.030	0.030
	9Х	0.80–0.95	0.25–0.45	0.25–0.35	0.030	0.030
	Х05	1.25–1.40	≤0.35	0.20–0.40	0.030	0.030
	7Х3	0.60–0.75	≤0.35	0.20–0.40	0.030	0.030
	8Х3	0.76–0.85	≤0.35	0.20–0.40	0.030	0.030
Chrome-silicon	9ХС	0.85–0.95	1.20–1.60	0.30–0.60	0.030	0.030
	6ХС	0.60–0.70	0.6–1.00	≤0.40	0.030	0.030
	4ХС	0.35–0.45	1.20–1.60	≤0.40	0.030	0.030

Continued

composition								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.15	0.20	—	—	—	—	—	0.20	ГОСТ 1435-54
0.15	0.20	—	—	—	—	—	0.20	
0.15	0.20	—	—	—	—	--	0.20	
0.15	0.20	—	—	—	—	—	0.20	
1.5—13.0	—	—	—	—	—	—	—	ГОСТ 5950-51
11.0—12.5	—	—	0.40—0.60	0.15—0.30	—	—	—	
1.30—1.60	—	—	—	—	—	—	—	
1.30—1.60	—	—	—	—	—	—	—	
0.75—1.05	—	—	—	—	—	—	—	
1.40—1.70	—	—	—	—	—	—	—	
0.40—0.60	—	—	—	—	—	—	—	
3.20—3.80	—	—	—	—	—	—	—	
3.20—3.80	—	—	—	—	—	—	—	
0.95—1.25	—	—	—	—	—	—	—	
1.00—1.30	—	—	—	—	..	—	—	
1.30—1.60	—	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-silico-manganese	ХГС	0.95—1.10	0.5—1.0	0.8—1.0	0.030	0.030
Vanadium	Ф	0.95—1.05	⩽0.35	0.20—0.40	0.030	0.030
Chrome-vanadium	8ХФ	0.75—0.85	⩽0.35	0.20—0.40	0.030	0.030
	85ХФ	0.8—0.9	⩽0.35	0.30—0.60	0.030	0.030
Tungsten	В1	1.05—1.25	⩽0.35	0.20—0.40	0.030	0.030
Chrome-tungsten	3Х2В8	0.30—0.40	⩽0.35	0.20—0.40	0.030	0.030
	4Х8В2	0.35—0.45	⩽0.35	0.20—0.40	0.030	0.030
	ХВ5	1.25—1.50	⩽0.30	⩽0.30	0.030	0.030
Chrome-tungsten-silicon	4ХВ2С	0.35—0.44	0.60—0.90	0.20—0.40	0.030	0.030
	5ХВ2С	0.45—0.54	0.50—0.80	0.20—0.40	0.030	0.030
	6ХВ2С	0.55—0.65	0.50—0.80	0.20—0.40	0.030	0.030
Chrome-tungsten-manganese	ХВГ	0.90—1.05	0.15—0.35	0.80—1.10	0.030	0.030
	9ХВГ	0.85—0.95	0.15—0.35	0.90—1.20	0.030	0.030
	5ХВГ	0.55—0.70	0.15—0.35	0.90—1.20	0.030	0.030
Chrome-manganese-molybdenum	5ХГМ	0.50—0.60	0.25—0.65	1.20—1.60	0.030	0.030
Chrome-nickel	5ХНМ	0.50—0.60	⩽0.35	0.50—0.80	0.030	0.030

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
1.4—1.8	—	—	—	—	—	—	—	ГОСТ 5950-51
—	—	—	—	0.20—0.40	—	—	—	
0.50—0.80	—	—	—	0.15—0.30	—	—	—	
0.45—0.70	—	—	—	0.15—0.30	—	—	—	
0.10—0.30	—	0.80—1.20	—	0.15—0.30	—	—	—	
2.20—2.70	—	7.50—9.00	—	0.20—0.50	—	—	—	
7.00—9.00	—	2.00—3.00	—	—	—	—	—	
0.40—0.70	—	4.50—5.50	—	0.15—0.30	—	—	—	
1.00—1.30	—	2.00—2.50	—	—	—	—	—	
1.00—1.30	—	2.00—2.50	—	—	—	—	—	
1.00—1.30	—	2.20—2.70	—	—	—	—	—	
0.90—1.20	—	1.20—1.60	—	—	—	—	—	
0.50—0.80	—	0.50—0.80	—	—	—	—	—	
0.50—0.80	—	0.50—0.80	—	—	—	—	—	
0.60—0.90	—	—	0.15—0.90	—	—	—	—	
0.50—0.80	1.40—1.80	—	0.15—0.30	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-nickel	5XHT	0.50—0.60	⩽0.35	0.50—0.80	0.030	0.030
High-speed	P18	0.7—0.8	⩽0.4	⩽0.4	0.030	0.030
	P9	0.85—0.95	⩽0.4	⩽0.4	0.030	0.030
	P9Φ5	1.4—1.5	⩽0.4	⩽0.4	0.035	0.030
	P14Φ4	1.2—1 3	⩽0.4	⩽0.4	0.035	0.030
	P18Φ2	0.85—0.95	⩽0.4	⩽0.4	0.03	0.030
	P9K5	0.9—1.0	⩽0.4	⩽0.4	0.03	0.030
	P9K10	0.9—1.0	⩽0.4	⩽0.4	0.030	0.030
	P10K5Φ5	1.45—1.55	⩽0 4	⩽0.4	0.035	0.030
	P18K5Φ2	0.85—0.95	⩽0.4	⩽0.4	0.030	0.030
					Special	
Chrome	1X13 (ЭЖ1)	<0.15	⩽0.6	<0.6	0.035	0.030
	2X13 (ЭЖ2)	0.16—0.24	⩽0.6	<0.6	0.035	0.030
	3X13 (ЭЖ3)	0.25—0.34	<0.6	<0.6	0.035	0.030
	4X13 (ЭЖ4)	0.35—0.45	<0.6	<0.6	0.035	0.030

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
0.9—1.25	1.40—1.80	—	—	—	0.08—0.15	—	—	ГОСТ 5950-51
3.8—4.4	≤0.4	17.5—19.0	0.3	1.0—1.4	—	—	—	ГОСТ 59-9373-60
3.8—4.4	≤0.4	8.5—10.0	0.3	2.0—2.6	—	—	—	
3.8—4.4	≤0.4	9—10.5	0.4	4.3—5.1	—	—	—	
4.0—4.6	≤0.4	13—14.5	0.4	3.4—4.1	—	—	—	
3.8—4.4	≤0.4	17.5—19	0.5	1.8—2.4	—	—	—	
3.8—4.4	≤0.4	9—10.5	0.3	2.0—2.6	—	—	Co 5.0—6.0	
3.8—4.4	≤0.4	9—10.5	0.3	2.0—2.6	—	—	Co 9.5—10.5	
4.0—4.6	≤0.4	10—11.5	0.3	4.3—5.1	—	—	5.0—6.0	
3.8—4.4	≤0.4	17.5—19	0.5	1.8—2.4	—	—	5.0—6.0	
steel								
12.0—14.0	<0.6	—	—	—	—	—	—	ГОСТ 5632-51
12.0—14.0	<0.6	—	—	—	—	—	—	
12.0—14.0	<0.6	—	—	—	—	—	—	
12.0—14.0	<0.6	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome	Х17 (ЭЖ17)	0.12	0.8	0.7	0.035	0.030
	Х25 (ЭИ181)	0.20	1.0	0.8	0.035	0.030
	Х28 (ЭЖ27 and ЭИ349)	0.15	1.0	0.8	0.035	0.030
	Х18 (ЭИ229)	0.9—1.0	0.8	0.7	0.030	0.030
	Х14 (ЭИ241)	0.15	0.7	0.7	0.035	0.2—0.4
Chrome-nickel	0Х18Н9 (ЭЯ0)	0.07	0.8	2.0	0.035	0.030
	1Х18Н9 (ЭЯ1)	0.14	0.8	2.0	0.035	0.030
	2Х18Н9 (ЭЯ2)	0.15—0.25	0.8	2.0	0.035	0.030
	Х17Н2 (ЭИ268)	0.11—0.17	0.8	0.8	0.035	0.030
	Х23Н13 (ЭИ319)	0.20	1.0	2.0	0.035	0.030
	Х23Н18 (ЭИ417)	0.20	1.0	2.0	0.035	0.030
Chrome-silicon	Х6С (ЭСХ6)	0.15	1.5—2.0	0.7	0.030	0.030
	Х9С2 (ЭСХ8)	0.35—0.50	2.0—3.0	0.7	0.030	0.030
	Х25С3Н (ЭИ261	0.35	2.5—3.5	0.7	0.035	0.030
Chrome-molybdenum	Х5М (ЭХ5М)	0.15	0.5	0.6	0.030	0.030
Chrome-titanium	Х25Т (ЭИ439)	≤0.15	≤1.0	<0.8	0.035	0.030
Chrome-nickel-silicon	Х13Н7С2 (ЭИ72)	0.25—0.37	2.0—3.0	<0.7	0.030	0.030

Continued

composition, %								
Cr	Ni	W	Mo	V	Ti	Al	Other elements	State standards
16.0–18.0	⩽0.6	—	—	—	—	—	—	ГОСТ 5632-51
23.0–27.0	⩽0.6	—	—	—	—	—	—	
27.0–30.0	⩽0.6	—	—	—	—	—	—	
17.0–19.0	⩽0.6	—	—	—	—	—	—	
13.0–15.0	⩽0.6	—	—	—	—	—	—	
17.0–20.0	8.0–11.0	—	—	—	—	—	—	
17.0–20.0	8.0–11.0	—	—	—	—	—	—	
17.0–20.0	8.0–11.0	—	—	—	—	—	—	
16.0–18.0	1.5–2.5	—	—	—	—	—	—	
22.0–25.0	12.0–15.0	—	—	—	—	—	—	
22.0–25.0	17.0–20.0	—	—	—	—	—	—	
5.0–6.5	⩽0.6	—	—	—	—	—	—	
8.0–10.0	⩽0.6	—	—	—	—	—	—	
23.0–27.0	0.7–1.3	—	—	—	—	—	—	
4.0–6.0	—	—	0.50–0.60	—	—	—	—	
23.0–27.0	⩽0.6	—	—	—	4C*up to 0.8	—	—	
11.5–14.0	6.0–7.5	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-nickel-silicon	Х18Н25С2 (ЭЯ3С)	0.30—0.10	2.0—3.0	⩽1.5	0.035	0.025
	Х20Н14С2 (ЭИ211)	⩽0.20	2.0—3.0	⩽1.5	0.035	0.030
	Х25Н20С2 (ЭИ283)	⩽0.20	2.0—3.0	⩽1.5	0.035	0.030
Chrome-nickel-titanium	Х18Н9Т (ЭЯ1Т)	⩽0.12	⩽0.8	⩽2.0	0.035	0.030
Chrome-nickel-tungsten	4Х14Н14В2М (ЭИ69)	0.40—0.50	⩽0.8	⩽0.7	0.030	0.030
	1Х14Н14В2М (ЭИ257)	⩽0.15	⩽0.8	⩽0.7	0.035	0.030
Chrome-nickel-niobium	Х18Н11Б (ЭИ398 and ЭИ402)	⩽0.10	⩽1.0	⩽2.0	0.035	0.030
Chrome-manganese-nickel	Х13Н4Г9 (ЭИ100)	0.15—0.30	⩽0.8	8.0—10.0	0.060	0.030
Chrome-silico-molybdenum	Х6СМ (ЭСХ6М)	⩽0.15	1.5—2.0	⩽0.7	0.035	0.030
	Х7СМ	⩽0.15	1.5—2.0	⩽0.7	0.035	0.030
	Х10С2М (ЭИ107)	0.35—0.45	1.9—2.6	⩽0.7	0.035	0.030
Chrome-silico-aluminium	Х12ЮС (ЭИ404)	0.07—0.12	1.2—2.0	⩽0.7	0.035	0.030
Chrome-nickel-molybdenum-titanium	Х18Н12М2Т (ЭИ171 and ЭИ448)	⩽0.12	⩽0.8	⩽2.0	0.035	0.030
	Х18Н12М3Т (ЭИ183, ЭИ432, ЭИ397)	⩽0.12	⩽0.8	⩽2.0	0.035	0.030

Continued

composition, %								
Cr	Ni	W	Mo	V	Ti	Al	Other elements	State standards
17.0—20.0	23.0—26.0	—	—	—	—	—	—	ГОСТ 5632-51
19.0—22.0	12.0—15.0	—	—	—	—	—	—	
23.0—27.0	18.0—21.0	—	—	—	—	—	—	
17.0—20.0	8.0—11.0	—	—	—	(C*—0.03)·5 up to 0.8	—	—	
13.0—15.0	13.0—15.0	2.0—2.75	0.25—0.40	—	—	—	—	
13.0—15.0	13.0—15.0	2.0—2.75	0.45—0.60	—	—	—	—	
17.0—20.0	9.0—13.0	—	—	—	—	—	Nb 8C* up to 1.5	
12.0—14.0	3.7—5.0	— —	—	—	—	—	—	
5.0—6.5	—	—	0.45—0.60	—	—	—	—	
6.5—8.0	—	—	0.45—0.60	—	—	—	—	
9.0—10.0	⩽0.5	—	0.7—0.9	—	—	—	—	
11.5—14.0	⩽0.5	—	—	—	—	1.0—1.8	—	
16.0—19.0	11.0—14.0	—	2.0—3.0	—	0.3—0.6	—	—	
16.0—19.0	11.0—14.0	—	3.0—4.0	—	0.3—0.6	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Chrome-nickel silico-tungsten	X14H14CB2M (ЭИ240)	0.40—0.50	2.75—3.25	⩽0.7	0.030	0.030
High-resistance alloys	X13Ю4	⩽0.15	⩽1.0	⩽0.7	0.035	0.025
	0X23Ю5	⩽0.06	⩽0.7	⩽0.5	0.025	0.020
	0X23Ю5A	⩽0.05	⩽0.6	⩽0.3	0.015	0.015
	0X27Ю5A	⩽0.05	⩽0.6	⩽0.3	0.015	0.015
	X15H60	⩽0.15	0.4—1.3	⩽1.5	0.035	0.025
	X20H80	⩽0.15	0.4—1.3	⩽0.7	0.030	0.025
	X20H80T3	⩽0.08	⩽1.0	⩽0.5	0.020	0.015
		Steel with special				
Steel for permanent magnets	EX	0.95—1.10	0.17—0.40	0.20—0.40	0.03	0.02
	EX3	0.90—1.10	0.17—0.40	0.20—0.40	0.03	0.02
	E7B6	0.68—0.78	0.17—0.40	0.20—0.40	0.03	0.02
	EX5K5	0.90—1.05	0.17—0.40	0.20—0.40	0.03	0.02
	EX9K15M	0.90—1.05	0.17—0.40	0.20—0.40	0.03	0.02
		Steel for				
Carbon	Св-08	⩽0.10	⩽0.03	0.35—0.60	0.04	0.04
	Св-08A	⩽0.10	⩽0.03	0.35—0.60	0.03	0.03

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
13.0—15.0	13.0—15.0	1.75—2.75	0.25—0.40	—	—	—	—	ГОСТ 5632-51
12.0—15.0	≤0.6	—	—	—	—	3.5—5.5	Fe remainder	ГОСТ 9232-59
21.5—24.5	≤0.6	—	—	—	—	4.5—5.5	remainder	
21.5—23.5	≤0.6	—	—	—	—	4.5—5.2	remainder	
26.0—28.0	≤0.6	—	—	—	—	5.0—5.8	remainder	
15.0—18.0	55.0—61.0	—	—	—	—	≤0.2	remainder	
20.0—23.0	75—78	—	—	—	—	≤0.2	≤1.0	
19.0—23.0	remainder	—	—	—	—	0.4—1.1	≤2.5	
physical properties								
1.30—1.60	0.30	—	—	—	—	—	—	ГОСТ 6862-54
2.80—3.60	0.30	—	—	—	—	—	—	
0.30—0.50	0.30	5.20—6.20	—	—	—	—	—	
5.50—6.50	0.60	—	—	—	—	—	Co 5.50—6.50	
8.0—10.0	0.60	—	1.20—1.70	—	—	—	13.5—16.5	
welding electrodes								
≤0.15	≤0.30	—	—	—	—	—	—	ГОСТ 2246-60
≤0.10	≤0.25	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Carbon	Св-08ГА	≤0.10	≤0.03	0.8–1.10	0.03	0.03
	Св-10ГА	≤0.12	≤0.03	1.10–1.40	0.03	0.03
	Св-10Г2	≤0.12	≤0.03	1.50–1.90	0.04	0.04
Alloy	Св-08ГС	≤0.10	0.60–0.85	1.40–1.70	0.03	0.03
	Св-08Г2С	≤0.11	0.70–0.95	1.80–2.10	0.03	0.03
	Св-12ГС	≤0.14	0.60–0.90	0.80–1.10	0.03	0.03
	Св-10ХГ2С	0.06–0.12	0.7–0.95	1.7–2.1	0.03	0.03
	Св-10ГСМТ	0.08–0.14	0.40–0.70	1.00–1.30	0.03	0.03
	Св-12Г2Х	0.10–0.15	≤0.30	1.60–1.90	0.03	0.03
	Св-08ХНМ	≤0.10	0.12–0.35	0.50–0.80	0.03	0.03
	Св-10НМ	≤0.12	0.12–0.35	0.40–0.70	0.03	0.03
	Св-08ХН2М	≤0.10	0.12–0.35	0.55–0.85	0.03	0.03
	Св-18ХГСА	0.15–0.22	0.90–1.20	0.80–1.10	0.03	0.025
	Св-18ХМА	0.15–0.22	0.12–0.35	0.40–0.70	0.03	0.025
	Св-10ХМ	≤0.12	0.12–0.35	0.40–0.70	0.03	0.03
	Св-10МХ	≤0.12	0.12–0.35	0.40–0.70	0.03	0.03
	Св-08ХГС2М	≤0.10	0.60–0.90	1.40–1.80	0.03	0.03

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
≤0.10	≤0.25	—	—	—	—	—	—	ГОСТ 2246-60
≤0.20	≤0.30	—	—	—	—	—	—	
≤0.20	≤0.30	—	—	—	—	—	—	
≤0.20	≤0.25	—	—	—	—	≤0.05	—	
≤0.20	≤0.25	—	—	—	—	≤0.05	—	
≤0.20	≤0.30	—	—	—	—	—	—	
0.7–1.00	≤0.25	—	—	—	—	≤0.05	—	
≤0.30	≤0.30	—	0.20–0.40	—	0.05–0.12	—	—	
1.2–1.5	≤0.25	—	—	—	—	—	—	
0.70–0.90	0.80–1.20	—	0.25–0.45	—	—	—	—	
≤0.20	1.00–1.50	—	0.40–0.55	—	—	—	—	
0.70–1.00	1.40–1.80	—	0.20–0.40	—	—	—	—	
0.80–1.10	≤0.30	—	—	—	—	—	—	
0.80–1.10	≤0.30	—	0.15–0.30	—	—	—	—	
0.80–1.10	≤0.30	—	0.40–0.60	—	—	—	—	
0.45–0.65	≤0.30	—	0.40–0.60	—	—	—	—	
0.80–1.10	≤0.30	—	0.40–0.60	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
Alloy	**Св-10ХМТФ**	0.07—0.12	≤0.35	0.40—0.70	0.03	0.03
	Св-08ХГСМФ	≤0.10	0.60—0.90	1.20—1.60	0.03	0.03
	Св-08ХМФ	≤0.10	0.12—0.35	0.40—0.70	0.03	0.03
	Св-08ХМФБ	≤0.10	0.12—0.35	0.40—0.70	0.03	0.03
	Св-08Х3Г2СМ	≤0.10	0.45—0.75	2.0—2.5	0.03	0.03
	Св-13Х2МТФ	0.10—0.15	≤0.35	0.40—0.70	0.03	0.03
	Св-08Х3МФБ	≤0.10	0.12—0.35	0.40—0.70	0.03	0.03
	Св-10Х5М	≤0.12	0.12—0.35	0.40—0.70	0.03	0.03
	Св-06Н3А	≤0.08	≤0.30	0.40—0.70	0.03	0.025
High alloy	**Св-10Х11МФН**	0.08—0.15	0.25—0.55	0.35—0.65	0.03	0.03
	Св-10Х11ВМФН	0.08—0.13	0.30—0.60	0.35—0.65	0.03	0.03
	Св-06Х14	≤0.08	0.3—0.7	0.30—0.70	0.03	0.03
	Св-10Х13	0.08—0.15	0.30—0.70	0.30—0.70	0.03	0.03
	Св-08Х14ГТ	≤0.10	0.25—0.65	0.90—1.30	0.035	0.03
	Св-10Х17Т	≤0.12	≤0.8	≤0.7	0.035	0.03
	Св-13Х25Т	≤0.15	≤1.0	≤0.8	0.035	0.03

Continued

composition, %								
Cr	Ni	W	Mo	V	Ti	Al	Other elements	State standards
1.4–1.8	≤0.30	—	0.40–0.60	0.05–0.35	0.05–0.12	—	—	ГОСТ 2246-60
0.95–1.25	≤0.30	—	0.50–0.70	0.20–0.40	—	—	—	
1.00–1.40	≤0.30	—	0.60–0.80	0.15–0.35	—	—	—	
1.10–1.50	≤0.30	—	0.70–0.90	0.15–0.35	—	—	Nb 0.10–0.35	
2.0–3.00	≤0.30	—	0.30–0.50	—	—	—	—	
1.7–2.2	≤0.30	—	0.40–0.60	0.15–0.35	0.05–0.12	—	—	
2.20–2.60	≤0.30	—	0.60–0.80	0.15–0.35	—	—	Nb 0.20–0.50	
4.00–6.00	≤0.30	—	0.40–0.60	—	—	—	—	
≤0.30	3.00–3.50	—	—	—	—	—	—	
10.50–12.00	0.60–0.90	—	0.60–0.90	0.25–0.50	—	—	—	
10.50–12.00	0.80–1.10	1.00–1.40	1.00–1.30	0.25–0.50	—	—	—	
13.0–15.0	≤0.6	—	—	—	—	—	—	
12.0–14.0	≤0.60	—	—	—	—	—	—	
13.0–15.0	≤0.60	—	—	—	0.60–1.00	—	—	
16.0–18.0	≤0.6	—	—	—	≤0.5	—	—	
23.0–27.0	≤0.6	—	—	—	≤0.5	—	—	

Type	Grade	Chemical				
		C	Si	Mn	S	P
					maximum	
High alloy	Св-02Х19Н9	≤0.04	0.50–1.00	1.00–2.00	0.025	0.018
	Св-04Х19Н9	≤0.06	0.50–1.00	1.00–2.00	0.025	0.018
	Св-04Х19Н9С2	≤0.06	2.00–2.75	1.00–2.00	0.025	0.018
	Св-06Х19Н9Т	≤0.08	0.40–1.00	1.00–2.00	0.030	0.018
	Св-05Х19Н9Ф3С2	≤0.07	1.30–1.80	1.00–2.00	0.030	0.025
	Св-07Х18Н9ТЮ	≤0.09	≤0.80	≤2 00	0.030	0.015
	Св-08Х19Н9Ф2С2	≤0.10	13–18	1.0–2.0	0.030	0.025
	Св-08Х19Н10Б	0.05–0.10	≤0.70	1.20–1.70	0.025	0.018
	Св-04Х19Н11М3	≤0.06	≤0.60	1.00–2.00	0.025	0.018
	Св-10Х16Н25М6	0.08–0.12	≤0.60	1.00–2.00	0.025	0.018
	Св-06Х19Н10М3Т	≤0.08	0.30–0.80	1.00–2.00	0.030	0.018
	Св-30Х15Н35В3Б3Т	0.26–0.32	≤0.20	0.50–1.00	0.025	0.015
	Св-08Х19Н12М3	0.06–0.10	0.3–0.7	1.0–1.7	0.025	0.018
	Св-10Х20Н15	≤0.12	≤0.80	1.00–2.00	0.025	0.018

Continued

composition, %								
Cr	Ni	W	Mo	V	Ti	Al	Other elements	State standards
18.0—20.0	8.0—10.0	—	—	—	—	—	—	ГОСТ 2246-60
18.0—20.0	8.0—10.0	—	—	—	—	—	—	
18.0—20.0	8.0—10.0	—	—	—	—	—	—	
18.0—20.0	8.0—10.0	—	—	—	0.50—1.00	—	—	
18.0—20.0	8.0—10.0	—	—	2.20—2.70	—	—	—	
17.0—19.0	8.0—10.0	—	—	—	1.0—1.4	0.6—0.95	—	
18.0—20.0	8.0—10.0	—	—	1.8—2.4	—	—	—	
18.5—20.5	9.0—10.5	—	—	—	—	—	Nb 1.2—1.5 $\frac{Cr}{Ni} \leqslant 2.05$	
18.0—20.0	10.0—12.0	—	2.0—3.0	—	—	—	—	
15.0—17.5	24.0—27.0	—	5.50—7.00	—	—	—	N 0.1—0.2	
18.0—20.0	9.0—11.0	—	2.0—3.0	—	0.50—0.80	—	—	
14.0—16.0	34.0—36.0	2.50—3.00	—	—	0.60—1.00	—	Nb 2.80—3.30	
18.5—20.5	11.5—13.0	—	2.3—2.8	—	—	—	—	
19.0—22.0	14.0—16.0	—	—	—	—	—	—	

Type	Grade	Chemical				
		C	Si	Mn	P	S
					maximum	
High alloy	Св-07Х25Н13	⩽0.09	0.50—1.00	1.00—2.00	0.025	0.018
	Св-13Х25Н18	⩽0.15	⩽0.50	1.00—2.00	0.025	0.018
	Св-08Х20Н10Г6	⩽0.10	0.20—0.70	5.0—7.0	0.035	0.018
	Св-08Х20Н9Г7Т	⩽0.10	0.50—1.00	6.00—8.00	0.035	0.018
	Св-25Х25Н16Г7	0.20—0.28	⩽0.30	6.0—8.0	0.030	0.018
	Св-08Х25Н5ТМФ	⩽0.10	⩽1.00	⩽0.80	0.030	0.018
	Св-08Н50	⩽0.10	⩽0.50	⩽0.50	0.030	0.020
Sheet steel for motor vehicle bodies	08 кп	⩽0.08	—	0.30—0.45	0.020	0.030
	08Ф кп	⩽0.08	—	0.30—0.45	0.020	0.030
	08Ю	⩽0.08	—	0.30—0.45	0.020	0.030

Continued

composition, %								State standards
Cr	Ni	W	Mo	V	Ti	Al	Other elements	
23.0—26.0	12.0—14.0	—	—	—	—	—	—	
24.0—27.0	17.0—20.0	—	—	—	—	—	—	ГОСТ 2246-60
20.0—22.0	9.0—11.0	—	—	—	—	—	—	
18.0—22.0	8.0—10.0	—	—	—	0.60—0.90	—	—	
24.0—27.0	15.0—17.0	—	—	—	—	—	—	
24.0—26.5	4.80—5.70	—	0.06—0.12	0.08—0.15	0.08—0.2	—	N 0.1—0.2	
⩽0.30	48.0—53.0	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	ГОСТ 9045-59
—	—	—	—	0.02—0.04	—	—	—	
—	—	—	—	—	—	6—0.07	—	

MECHANICAL AND TECHNOLOGICAL PROPERTIES OF VARIOUS GRADES OF STEEL

ORDINARY QUALITY CARBON STEEL

ГОСТ 380-60

Mechanical Properties

Grade	Yield point, kg/mm², minimum, for different classes of rolled stock thickness			Tensile strength, kg/mm²	Elongation, %		Cold bending test, 180° (a—thickness of specimen; d—diameter of arbor)
					δ_{10}	δ_5	
	1	2	3		minimum		
Ст. 0	—	—	—	$\geqslant 32$	18	22	$d=2a$
Ст. 1 Ст. 1 кп	—	—	—	32—40	28	33	$d=0$
Ст. 2 Ст. 2 кп	22	20	19	34—42	26	31	$d=0$
Ст. 3 кп	24	22	21	38—40 41—43 44—47	23 22 21	27 26 25	$d=0.5a$
Ст. 3	24	23	22	38—40 41—43 44—47	23 22 21	27 26 25	$d=0.5a$
Ст. 4 Ст. 4 кп	26	25	24	42—44 45—48 49—52	21 20 19	25 24 23	$d=2a$
Ст. 5	28	27	26	50—53 54—57 58—62	17 16 15	21 20 19	$d=3a$
Ст. 6	31	30	30	60—63 64—67 68—72	13 12 11	16 15 14	—
Ст. 7	—	—	—	70—74 $\geqslant 75$	9 8	11 10	—

SPECIAL PURPOSE CARBON STEEL

Mechanical Propertiss

Purpose	Grade	Yield point, minimum	Tensile strength, δ_b	Elongation, %			Impact strength, kgm/cm²	Cold bending test, 180° d—diameter of arbor	
				δ_b	δ_{10}	δ_5			
		kg/mm²		minimum				Thickness of sheet	
								$a \leqslant$ 30 mm	$a >$ 30 mm
Sheet steel for boiler-making (ГОСТ 5520-50)	15K	22	36—44	36—38	24	28	8	$d=0$	$d=a$
				39—40	23	27			
				41—42	22	26	7		
				43—44	21	25			
	20K	25	41—50	41—42	22	26	7	$d=a$	$d=2a$
				43—44	21	25			
				45—47	20	24	6		
				48—50	19	23			
	25K	28	45—55	45—48	20	24	6	$d=2a$	$d=3a$
				49—52	19	23			
				53—55	18	22			

Sheet steel for locomotives (ГОСТ 399-41)	Ст. 3Т		36—46	36—38 39—40 41—42 43—46	26 25 24 23		8 8 7 7 after ageing ≥3	$d=0$	
	Ст. 3К		≥38	38—40 41—42 43—44 over 44	24 23 22 21		7 7 6 6	$d=0.5a$	
Sheet steel for boilers of river and seagoing vessels (ОСТ НКТП 4034)	Ст. 3ТС		38—45	38—41 42—43 44—45	25 24 23		8	$d=0$ (for non-hardenability)	
	Ст. 4Т		41—48		23		8	$d=a$ (for non-hardenability)	
(ОСТ НЛТП-4034)	Ст. 5К		47—56	47—52 53—56	21 20		6	$d=1.5a$	

Continued

Purpose	Grade	Yield point, minimum	Tensile strength, δ_b	Elongation. %			Impact strength, kgm/cm²	Cold bending test, 180° d—diameter of arbor	
				δ_b	δ_{10}	δ_5		Thickness of sheet	
		kg/mm²		minimum				$a \leqslant$ 30 mm	$a >$ 30 mm
Ship-building steel (ГОСТ 5521-50)				Elongation δ_{10} at sheet thickness					
				2—2.5	3—3.5	3.75			
	Ст. 2С		34—42	20	21	22		$d=0$	
	Ст. 3С		38—47	16	17	18		$d=0.5a$	
Sheets	Ст. 4С		42—52	14	15	16		$d=2a$	
and	Ст. 5С improved		50—62	12	13	14		$d=2a$	

plates	Ст. 4Л	25	42—50		20	24		$d=2a$	
	Ст. 4Ф	24	41—47		20	24		$d=2a$	
	Ст. 5С improved	30	50—62		18	22		$d=2a$	
Bridge-building steel (ГОСТ 6713-53)	M16C	23	⩾38	Grade sheet	24 22	28 26	Impact ductility −20° 10 8 7	4 4 longitudinal specimens 3.5 transverse specimens	after ageing 5 4 3.5
	Ст. 3 мост	24	⩾38	Grade sheet	24 22	28 26	10 8 7	4 4 3.5	longitudinal specimens transverse specimens

QUALITY CARBON STRUCTURAL STEEL

ГОСТ 1050-60

In steel intended for cold working and cold drawing, as delivered, the Brinell hardness corresponds to the following specifications:

Grade	Group I				Grade	Group II			
	hot-rolled steel		annealed steel			hot-rolled steel		annealed steel	
	diameter of impression, mm, minimum	Brinell hardness, maximum	diameter of impression, mm, minimum	Brinell hardness, maximum		diameter of impression, mm, minimum	Brinell hardness, maximum	diameter of impression, mm, minimum	Brinell hardness, maximum
08кп 08	5.2	131	–	–					
10кп 10	5.1	137	–	–					
15кп 15	5.0	143	–	–	15Г	4.7	163	–	–

20 кп 20	4.8	156	—	—	20Г	4.3	197	—	—
25	4.6	170	—	—	25Г	4.2	207	—	—
30	4.5	179	—	—	30Г	4.1	217	4.4	187
35	4.4	187	—	—	35Г	4.0	229	4.3	197
40	4.1	217	4.4	187	40Г	4.0	229	4.2	207
45	3.9	241	4.3	197	45Г	3.9	241	4.1	217
50	3.9	241	4.2	207	50Г	3.8	255	4.1	217
55	3.8	255	4.1	217					
60	3.8	255	4.0	229	60Г	3.7	269	4.0	229
65	3.8	255	4.0	229	65Г	3.6	285	4.0	229
70	3.7	269	4.0	229	70Г	3.6	285	4.0	229
75	3.6	285	3.9	241					
80	3.6	285	3.9	241					
85	3.5	302	3.8	255					

Note. Group I—steel with normal manganese content. Group II—steel with increased manganese content.

Mechanical Properties of Steels Determined with Specimens Taken from Normalized Semi-Finished Rolled Stock

Grade	Yield point	Tensile strength	Elongation, δ_5	Reduction	Impact strength
	minimum				
	$\mathrm{kg/mm^2}$		%		$\mathrm{kgm/cm^2}$
			Group I		
08кп	18	30	35	60	—
08	20	33	33	60	—
10кп	19	32	33	55	—
10	21	34	31	55	—
15кп	21	36	29	55	—
15	23	38	27	55	—
20кп	23	39	27	55	—
20	25	42	25	55	—
25	28	46	23	50	9
30	30	50	21	50	8
35	32	54	20	45	7
40	34	58	19	45	6
45	36	61	16	40	5
50	38	64	14	40	4
55	39	66	13	35	—
60	41	69	12	35	—
65	42	71	10	30	—
70	43	73	9	30	—
75	90	110	7	30	—
80	95	110	6	30	—
85	100	115	6	30	—

Continued

Grade	Yield point	Tensile strength	Elongation, δ_5	Reduction	Impact strength
	minimum				
	kg/mm²		%		kgm/cm²
Group II					
15Г	25	42	26	55	—
20Г	28	46	24	50	-
25Г	30	50	22	50	9
30Г	32	55	20	45	8
35Г	34	57	18	45	7
40Г	36	60	17	45	6
45Г	38	63	15	40	5
50Г	40	66	13	40	4
60Г	42	71	11	35	—
65Г	44	75	9	30	—
70Г	46	80	8	30	—

LOW-ALLOY STRUCTURAL STEEL

ГОСТ 5058—57

Grade	Thickness of rolled stock, mm	Mechanical properties at time of shipment			Cold bending test. c—diameter of arbor, a—thickness of specimen, d—diameter of rod
		Tensile strength	Yield point	Elongation, δ_{10}	
		kg/mm^2		%	
		minimum			
15ГС	4—10	50	35	18	180° $c=2a$
	11—20	48	34	18	
18Г2С	6—8	60	40	14	90° $c=3d$
25Г2С	6—40	60	40	14	90° $c=3d$
10Г2СД (МК)	4—32	50	35	18	180° $c=2a$
14ХГС	4—10	50	35	18	180° $c=2a$
	11—20	50	34	18	
30ХГ2С	10—32	90	60	6	45° $c=5d$
14ХГСН	4—10	52	37	18	—
10ХГ2СН	4—10	50	37	18	—
10ХГСНД (МС-1)	4—32	54	40	16	180° $c=2a$
	33—40	51	37	15	—
10ХСНД (СХЛ-4)	4—32	54	40	16	180° $c=2a$
	33—40	51	37	15	—
15ХСНД (СХЛ-1, НЛ-2)	4—32	52	35	18	180° $c=2a$
12ХГ (БНЛ-2)	8—20	46	33	15	—
12ХГН	4—10	50	35	18	180° $c=2a$
	11—20	50	33	18	
	21—30	48	31	18	—
10ХГ2Н	4—10	50	36	18	—

Continued

Grade	Thickness of rolled stock, mm	Mechanical properties at time of shipment			Cold bending test. *c* — diameter of arbor, *a* — thickness of specimen, *d* — diameter of rod
		Tensile strength	Yield point	Elongation, δ_{10}	
		kg/mm²		%	
		minimum			
15ХГН	4—10	52	36	18	—
	11—20	49	35	18	—
14ХГ2Н	4—10	53	37	16	—
14Г	4—10	46	29	18	180° $c=2a$
19Г	4—10	47	30	18	180° $c=2a$
24Г	4—10	49	33	18	180° $c=2a$
	11—20	47	30	18	
09Г2	4—10	46	31	18	
	11—24	45	30	18	180° $c=2a$
	25—30	44	30	18	—
14Г2	4—10	48	34	18	180° $c=2a$
	11—20	47	33	18	
10ГНД	4—10	52	38	15	—
	11—20	50	38	15	—
14ГНД	4—10	54	40	15	—
	11—20	52	40	15	—
10ХНДП	4—12	48	35	18	180° $c=2a$

Impact strength after mechanical ageing or at a temperature of −40° C shall be at least 3 kgm/cm² (when thickness of rolled stock = 10—20 mm).

ALLOY STRUCTURAL STEEL

ГОСТ 4543-48

Group No	Grade	Heat treatment					Mechanical properties				
		hardening			tempering		tensile strength, kg/mm^2	yield point, kg/mm^2	elongation, %	reduction of cross-section area, %	impact strength, kgm/cm^2
		temperature, °C		cooling medium	temperature, °C	cooling medium	minimum				
		first hardening	second hardening								
1	15X	860	780	Water	200	Air	70	50	10	45	7
	15XA	860	780	Water	200	Air	70	50	11	50	8
	20X	860	—	Water or oil	200	Air	80	60	10	40	6
	30X	860	—	Oil	500	Water or oil	90	70	11	45	6
	35X	860	—	Oil	500	Water or oil	95	75	10	45	6
	38XA	860	—	Oil	550	Water or oil	95	80	12	50	9
	40X	850	—	Oil	500	Water or oil	100	80	9	45	6
	45X	840	—	Oil	500	Water or oil	105	85	8	40	5
	50X	830	—	Oil	500	Water or oil	110	90	8	40	4

2	15XΦ	860	780	Water	200	Air	75	55	12	50	8
	20XΦ	880	—	Water or oil	500	Water or oil	80	60	12	50	8
	40XΦA	880	—	Oil	650	Water or oil	90	75	10	50	9
	50XΦA	860	—	Oil	475	Water or oil	130	110	10	45	—
4	20XM	880	—	Water or oil	500	Water or oil	80	60	12	50	9
	30XM	880	—	Oil	560	Water or oil	95	75	11	45	8
	30XMA	880	—	Oil	560	Water or oil	95	75	12	50	9
	35XM	850	—	Oil	560	Water or oil	95	80	11	45	7
	35XMA	850	—	Oil	560	Water or oil	95	80	12	50	8
	35X2MA	870	—	Oil	620	Water or oil	105	90	8	45	8
5	33XC	920	—	Water or oil	630	Water or oil	85	65	13	50	6
	37XC (40CX)	900	—	Oil	630	Oil	90	70	12	50	7
	40XC	900	—	Oil	540	Oil	125	105	12	40	5
6	20XΓ	860	—	Oil	180	Air	80	60	12	50	—
	35XΓ2	870	—	Oil	600	Water	85	70	12	45	8
7	18XΓM	860	—	Oil	190	Air	110	90	10	50	9
	40XΓM	850	—	Oil	600	Water or oil	100	80	10	45	9
8	27CΓ	920	—	Water	420	Water or oil	100	80	12	40	5
	35CΓ	900	—	Water	590	Water	85	65	15	40	6
9	20XΓC	880	—	Oil	500	Water or oil	80	60	10	40	6
	30XΓC	880	—	Oil	520	Water or oil	110	85	10	45	4.5

Continued

Group No.	Grade	Heat treatment					Mechanical properties				
		hardening			tempering		tensile strength, kg/mm^2	yield point, kg/mm^2	elongation, %	reduction of cross-section area, %	impact strength, kgm/cm^2
		temperature, °C		medium	temperature, °C	cooling medium	minimum				
		first hardening	second hardening								
	30ХГСА	880	—	Oil	520	Water or oil	110	85	10	45	5
	35ХГСА	Isothermic hardening from 880° in mixture of potassium and sodium nitrate at 280—310°C					165	130	9	40	6
10	35ХЮА	940	—	Warm water or oil	650	Water or oil	95	75	10	50	8
	38ХМЮА	940	—	Warm water or oil	650	Water or oil	100	85	15	50	9
11	35ХМФА	900	—	Oil	630	Water or oil	110	95	10	50	9
13	15НМ	860	780	Oil	200	Air	85	65	11	50	8
14	20ХН	840	—	Water or oil	500	Water or oil	80	60	10	50	8
	40ХН	820	—	Oil	500	Water or oil	100	80	10	45	7

	45XH	820	—	Oil	530	Water or oil	100	80	10	45	7
	50XH	820	—	Oil	500	Water or oil	110	85	8	40	5
	12XH2	860	780	Oil or water	200	Water or oil	80	60	12	50	8
	12XH2A	860	780	Oil or water	200	Water or oil	80	60	12	50	9
	12X3	860	780	Oil	150	Water or oil	95	70	10	50	8
	12XH3A	860	780	Oil	150	Water or oil	95	70	11	55	9
	20XH3A	820	—	Oil	500	Water or oil	95	75	11	55	10
	30XH3	820	—	Oil	530	Water or oil	100	80	9	45	8
	37XH3A	820	—	Oil	530	Water or oil	115	100	10	50	6
	12X2H4	880	780	Oil	200	Air	110	85	10	50	8
	12X2H4A	880	780	Oil	200	Air	110	85	10	50	9
	20X2H4	880	780	Oil	200	Air	120	110	9	45	7
	20X2H4A	880	780	Oil	200	Air	120	110	9	45	8
15	20XH4ΦA	850	—	Oil	510	Oil	110	90	10	50	8
16	18XHBA	950	850	Air	160	Air	115	85	12	50	10
	25XHBA	850	—	Oil	560	Oil	110	95	11	45	9
17	12X2H3MA	860	—	Oil	180	Water or oil	100	80	9	50	9
	18X2H4MA	950	850	Air	200	Air	115	85	10	45	10
	40XHMA	850	—	Oil	600	Water or oil	100	85	12	55	10
18	30XH2MΦA	860	—	Oil	680	Water or oil	90	80	10	40	9
	45XHMΦA	860	—	Oil	460	Oil	150	135	7	35	4

ALLOY STRUCTURAL STEEL

ГОСТ 4543-48

Group No.	Grade of steel		Annealed or tempered steel	
	quality	high quality	diameter of impression, mm, minimum	Brinell hardness, maximum
1	15Х	15ХА	4.5	179
	20Х	20ХА	4.5	179
	30Х	30ХА	4.4	187
	35Х	—	4.3	197
	—	38ХА	4.2	207
	40Х	—	4.1	217
	45Х	45ХА	4.0	229
	50Х	50ХА	4.0	229
2	15ХФ	15ХФА	4.4	187
	20ХФ	20ХФА	4.3	197
	—	40ХФА	3.9	241
	—	50ХФА	3.8	255
4	20ХМ	20ХМА	4.3	197
	30ХМ	30ХМА	4.0	229
	35ХМ	35ХМА	3.9	241
5	33ХС	33ХСА	3.9	241
	37ХС (40СХ)	—	3.8	255
	40ХС	40ХСА	3.8	255
6	20ХГ	20ХГА	4.4	187
	35ХГ2	35ХГ2А	4.0	229
	18ХГТ	—	4.1	217
7	18ХГМ	18ХГМА	4.1	217
	40ХГМ	40ХГМА	3.9	241
8	27СГ	—	4.1	217
	35СГ	—	4.0	229

Continued

Group No.	Grade of steel		Annealed or tempered steel	
	quality	high quality	diameter of impression, mm, minimum	Brinell hardness, maximum
9	20ХГС	20ХГСА	4.2	207
	25ХГС	25ХГСА	4.1	217
	30ХГС	30ХГСА	4.0	229
	35ХГС	35ХГСА	3.9	241
10	—	35ХЮА	4.0	229
	—	38ХМЮА	4.0	229
11	—	35ХМФА	4.0	229
13	15НМ	15НМА	4.3	197
14	20ХН	20ХНА	4.3	197
	40ХН	40ХНА	4.2	207
	45ХН	—	4.2	207
	50ХН	—	4.2	207
	12ХН2	12ХН2А	4.2	207
	12ХН3	12ХН3А	4.1	217
	—	20ХН3А	3.9	241
	30ХН3	30ХН3А	3.9	241
	—	37ХН3А	3.7	269
	12Х2Н4	12Х2Н4А	3.7	269
	20Х2Н4	20Х2Н4А	3.7	269
15	—	20ХН4ФА	3.7	269
16	—	18ХНВА	3.7	269
	—	25ХНВА	3.7	269
17	—	12Х2Н3МА	3.7	269
	—	18Х2Н4МА	3.7	269
	—	40ХНМА	3.7	269
18	—	30ХН2МФА	3.9	241
	—	45ХНМФА	3.7	269

CARBON TOOL STEEL

ГОСТ 1435-54

The fracture shall be homogeneous and fine-grained.

In the fracture there shall be no cavities, seams, fissures, bubbles or slag inclusions.

Dimensions	Depth of decarburized layer (ferrite + transition zone)
mm	
6—10	0.30
10—16	0.40
16—25	0.50
25—40	0.60
40—60	0.75
60	1.5% of thickness or diameter

Hardness of Annealed and Hardened Steel as Delivered

Grade	Hardness after annealing		Hardness after hardening	
	Brinell hardness HB	diameter of impression ($d=10$ mm, $P=3{,}000$kg), mm, minimum	hardening temperature (°C) and cooling medium	Rockwell hardness R_c (scale C), minimum
У7, У7А	187	4.4	800—820 Water	62
У8, У8А	187	4.4	780—800 Water	62
У8Г, У8ГА	187	4.4	780—800 Water	62
У9, У9А	192	4.35	760—780 Water	62
У10, У10А	197	4.3	760—780 Water	62
У11, У11А	207	4.2	760—780 Water	62
У12, У12А	207	4.2	760—780 Water	62
У13, У13А	217	4.1	760—780 Water	62

ALLOY TOOL STEEL

ГОСТ 5950-51

Grade	Hardness of steel as shipped		Hardness after hardening	
	Brinell hardness HB	diameter of impression, mm (*d*=10 mm, *P*=3,000 kg)	temperature (°C) and hardening medium	Rockwell hardness R_C (scale *C*), minimum
X12	269—217	3.7—4.1	950—1000 Oil	60
X12M	255—207	3.8—4.2	950—1000 Oil	58
XГ	241—197	3.9—4.3	800—830 Oil	61
X	229—187	4.0—4.4	830—860 Oil	62
X09	229—179	4.0—4.5	830—860 Oil	62
9X	217—179	4.1—4.5	820—850 Oil	62
X05	241—187	3.9—4.4	780—810 Water	64
7X3	229—187	4.0—4.4	850—880 Oil	54
8X3	255—207	3.8—4.2	850—880 Oil	55
9XC	241—197	3.9—4.3	820—860 Oil	62
6XC	229—187	4.0—4.4	840—860 Oil	56
4XC	207—170	4.2—4.6	880—900 Oil	47
XГC	255—207	3.8—4.2	820—860 Oil	62
Ф	217—179	4.1—4.5	780—820 Water	62
8XФ	207—170	4.2—4.6	800—850 Water	61
85XФ	—	—	— —	42
B1	229—187	4.0—4.4	800—850 Water	62
3X2B8	255—207	3.8—4.2	1075—1125 Oil	46
4X8B2	255—207	3.8—4.2	1025—1075 Oil	45
XB5	285—229	3.6—4.0	800—820 Water	65
XB5	321—255	3.4—3.8	800—820 Water	65
4XB2C	217—179	4.1—4.5	860—900 Water	53
5XB2C	255—207	3.8—4.2	860—900 Oil	55
6XB2C	285—229	3.6—4.0	860—900 Oil	57
XBГ	255—207	3.8—4.2	800—830 Oil	62
9XBГ	241—197	3.9—4.3	800—830 Oil	62
5XBГ	217—179	4.1—4.5	850—900 Oil	57
5XHM	241—197	3.9—4.3	830—860 Oil	47
5XГM	241—197	3.9—4.3	820—850 Oil	50
5XHT	⩽241	⩾3.9		

SPRING STEEL

ГОСТ 2052-53

Group	Grade	Heat treatment (recommended)			Mechanical properties, specification			
		hardening temperature, °C	hardening medium	tempering temperature, °C	yield point, kg/mm^2	tensile strength, kg/mm^2	elongation, %	reduction of cross-section area, %
					minimum			
Carbon	65	840	Oil	480	80	100	9	35
	70	830	Oil	480	85	105	8	30
	75	820	Oil	480	90	110	7	30
	85	820	Oil	480	100	115	6	30
Manganese	55ГС	820	Oil	480	80	100	8	30
	65Г	830	Oil	480	80	100	8	30
Silicon	50C2	870	Oil or water	460	110	120	6	30
	55C2	870		460	120	130	6	30
	60C2	870	Oil	460	120	130	5	25

	60C2A	870	Oil	460	140	160	5	20
	63C2A	860	Oil	460	140	160	5	20
	70C3A	860	Oil	460	160	180	5	25
Chrome-manganese	50XГ	840	Oil	490	110	130	5	35
	50XГA	840	Oil	490	120	130	6	35
Chrome-manganese-vanadium	50XГФA	850	Oil	520	120	130	6	35
Chrome-vanadium	50XФA	850	Oil	520	110	130	10	45
Chrome-silicon	60C2XA	870	Oil	420	160	180	5	20
Chrome-silico-vanadium	60C2XФA	850	Oil	410	170	190	5	20
Tungsten-silicon	65C2BA	850	Oil	420	170	190	5	20
Nickel-silicon	60C2H2A	850	Oil	420	160	175	5	20
Silico-manganese	55CГ	880	Oil	460	120	130	6	30
	60CГ	860	Oil	460	120	130	5	25
	50CГA	860	Oil	460	140	160	5	25

Hardness of Unannealed Steel as Delivered

Grade	Diameter of impression, mm, minimum	Brinell hardness, maximum
65	3.8	255
70, 65Г	3.7	269
75, 55ГС, 50С2, 55С2, 55СГ, 60СГ, 60СГА	3.6	285
85, 60С2, 50С2А, 70С3А, 50ХГ, 50ХГА, 50ХФА, 60С2ХФА, 65С2ВА, 60С2Н2А, 63С2А	3.5	302
60С2ХА, 50ХГФА	3.4	321

STAINLESS AND ACID-RESISTING SECTION STEEL

ГОСТ 5949-51

Group	grade	Heat treatment (recommended)				Mechanical properties				
		hardening		tempering		tensile strength, kg/mm^2	yield point, kg/mm^2	elongation, %	reduction of cross-section area, %	impact strength, kgm/cm^2
		temperature, °C	cooling medium	temperature, °C	cooling medium					
	minimum									
Chrome	1X13(ЭЖ1)	1000—1050	Oil, water	700—790	Oil, water, air	60	42	20	60	9
	2X13(ЭЖ2)	1000—1050	Oil, water	660—770	Oil, water, air	66	45	16	55	8
	3X13(ЭЖ3)	1000—1050	Oil	200—300	—	Hardness	48Rc	—	—	—
	4X13(ЭЖ4)	1050—1100	Oil	200—300	—	Hardness	50Rc	—	—	—
	X17(ЭЖ17)	annealing	—	760—780	Air	40	25	20	50	—
	X18(ЭИ229)	1000—1050	Oil	200—300	Oil, air	Hardness	55Rc	—	—	—

Continued

Group	grade	Heat treatment (recommended)				Mechanical properties				
		hardening		tempering						
		temperature, °C	cooling medium	temperature, °C	cooling medium	tensile strength, kg/mm²	yield point, kg/mm²	elongation, %	reduction of cross-section area, %	impact strength, kgm/cm²
		minimum								
Chrome	X25(ЭИ181)	—	—	—	—	45	30	20	45	—
	X28(ЭЖ27, ЭИ349)	—	—	—	—	45	30	20	45	—
Chrome-nickel	X17H2(ЭI 268)	950—975	Oil	275—300	—	110	—	10	—	5
	1X18H9(ЭЯ1)	1100—1150	Water	—	—	55	20	45	60	—
	2X18H9(ЭЯ2)	1100—1150	Water	—	—	58	22	40	55	—
	X23H13 (ЭИ319)	1100—1150	Oil, water, air	—	—	55	30	35	50	—
	X23H18 (ЭИ417)	1100—1150	Oil, water, air	—	—	55	30	35	50	—

Chrome-titanium	X25T (ЭИ439)	—	—	—	—	45	30	20	45	—
Chrome-nickel-silicon	X20H14C2 (ЭИ211)	—	—	—	—	60	30	35	50	—
	X25H20C2 (ЭИ283)	—	—	—	—	60	30	35	50	—
Chrome-nickel-titanium	1X18H9T (ЭЯ1T)	1100—1150	Water	—	—	55	20	40	55	—
Chrome-nickel-niobium	X18H11Б (ЭИ398, ЭИ402)	1100—1150	Water	—	—	55	20	40	55	—
Chrome-manganese-nickel	X13H4Г9 (ЭИ100)	1100—1150	Water	—	—	65	25	35	55	—
Chrome-nickel-molybdenum-titanium	X18H12M2T (ЭИ171, ЭИ448)	1100—1150	Water	—	—	55	22	40	55	
	X18H12M3T (ЭИ183, ЭИ432, ЭИ397)	1100—1150	Water	—	—	55	22	40	55	—

Hardness of Steel as Delivered

Grade	Diameter of impression, mm	Brinell hardness HB
1Х13	4.4—5.4	121—187
2Х13	4.3—5.3	126—197
3Х13	4.2—5.2	131—207
4Х13	4.0—5.0	143—229
Х17	4.3—5.3	126—197
Х18	minimum 3.8	maximum 255
Х17Н2	4.3—5.3	126—197

SECTION STEEL FOR PERMANENT MAGNETS

ГОСТ 6862-54

Grade	Retentivity B_r, gauss	Coercive force H_c, oersted	Product $B_r \times H_c$
	minimum		
ЕХ	9 000	58	550 000
ЕХ3	9 500	60	600 000
Е7В6	10 000	62	650 000
ЕХ5К5	8 500	100	900 000
ЕХ9К15М	8 000	170	1 400 000

Hardness of Steel as Delivered

Grade	Brinell hardness, min (P=3,000 kg, d=10 mm)	Diameter of impression, mm (d=10 mm)
ЕХ	255—207	3.8—4.2
ЕХ3	285—229	3.6—4.0
Е7В6	321—255	3.4—3.8
ЕХ5К5	341—269	3.3—3.7
ЕХ9К15М	341—285	3.3—3.6

FREE-CUTTING STEEL

ГОСТ 1414-54

Mechanical Properties of Steel as Shipped (Without Heat Treatment)

Hot-rolled steel

Grade	Tensile strength, kg/mm^2	Elongation, δ_5, %, minimum	Reduction of cross-sectional area, %, minimum	Brinell hardness, maximum
A12	42–57	22	36	160
A20	46–61	20	30	168
A30	52–67	15	25	185
A40Г	60–75	14	20	207

Cold-rolled steel

Grade	Tensile strength, kg/mm^2			Elongation, δ_5, %, minimum	Brinell hardness
	diameter of rod, mm				
	up to 20	20–30	over 30		
A12	60–80	55–75	52–70	7.0	167–217
A20	62–80	57–76	54–73	7.0	167–217
A30	64–84	60–80	55–77	6.0	174–223

QUALITY CALIBRATED STRUCTURAL STEEL

ГОСТ 1051—59

Hardness of Steel in Work Hardened and Annealed Condition

Grade	Work hardened steel		Annealed steel	
	Brinell hardness			
	diameter of impression, mm, minimum	hardness, maximum	diameter of impression, mm, minimum	hardness, maximum
05кп	4.5	179	5.2	131
08кп	4.5	179	5.2	131
10	4.4	187	5.0	143
15	4.3	197	4.9	149
20	4.2	207	4.7	163
25	4.1	217	4.6	170
30	4.0	229	4.5	179
35	4.0	229	4.4	187
40	3.9	241	4.3	197
45	3.9	241	4.2	207
50	3.8	255	4.1	217
60	3.7	269	4.0	229
15Г	4.2	207	4.7	163
50Г	3.7	269	4.1	217
65Г	—	—	4.0	229
50Г2	3.7	269	4.0	229
15Х	4.1	217	4.5	179
20Х	4.0	229	4.5	179
30Х	3.9	241	4.4	187
35Х	3.8	255	4.3	197
38ХА	3.7	269	4.2	207
40Х	3.7	269	4.2	207
45Х	3.7	269	4.1	217
38ХС	3.7	269	3.8	255
16ХСН	—	—	4.8	156
15ХФ	4.1	217	4.4	187
40ХФА	3.7	269	4.0	229
30ХГС	3.7	269	4.0	229
35ХГСА	—	—	4.0	229
18ХГТ	4.0	229	4.1	217

Continued

Grade	Work-hardened steel		Annealed steel	
	Brinell hardness			
	diameter of impression, mm, minimum	hardness, maximum	diameter of impression, mm, minimum	hardness, maximum
40XH	3.7	269	4.2	207
50XH	3.7	269	4.2	207
12XH3A	3.7	269	4.1	217
20XH3A	3.7	269	4.0	229
30XH3A	—	—	3.9	241
12X2H4	—	—	3.8	255
20X2H4A	—	—	3.7	269
40XHMA	—	—	3.8	255
38XMЮA	3.8	255	4.0	229
30XM	3.7	269	4.0	229
25X2MΦA	—	—	3.9	241
15XP	—	—	4.4	187

CALIBRATED CARBON STEEL

ГОСТ 1051-59

Mechanical Properties

Grade	Work-hardened steel			Annealed steel		
	tensile strength, kg/mm^2	Elongation, %, δ_5	Reduction of cross-sectional area, %	tensile strength, kg/mm^2	Elongation, %, δ_5	Reduction of cross-sectional area, %
10	42	8	50	30	26	55
15	45	8	45	35	23	55
20	50	7	40	40	21	50
25	55	7	40	42	19	50
30	57	7	35	45	17	45
35	60	6	35	48	15	45
40	62	6	35	52	14	40
45	65	6	30	55	13	40
50	67	6	30	57	12	40
15Г	50	7	40	40	21	50
50Г	70	5	30	60	10	35

Mechanical Properties of Annealed Calibrated Steel for Cold Upsetting

Grade	Brinell hardness		Tensile strength, kg/mm^2, maximum	Elongation, %, minimum	Reduction of cross-section area, %, minimum
	diameter of impression, mm, minimum	hardness, maximum			
10кп	5.2	131	45	26	60
15кп	5.1	137	48	23	55
35	4.8	156	55	18	50
45	4.7	163	58	15	50
40X	4.5	179	60	14	50
15XФ	5.0	143	45	20	60

QUALITY CARBON STRUCTURAL STEEL SHEETS

ГОСТ 914-56

Mechanical Properties of Sheets as Delivered

Grade	Type of drawing							
	ВГ	Г and Н	ВГ	Г	Н	ВГ	Г	Н
	tensile strength, kg/mm^2		elongation, %, minimum					
			cold-rolled sheets			hot-rolled sheets		
05 кп	26—36	26—38	34	32	30	30	29	27
08 кп	28—37	28—39	34	32	30	30	29	27
08 пс 10 кп	28—40	28—42	32	30	28	28	27	25
10	30—42	30—44	30	29	28	27	26	24
15 кп	32—44	32—46	29	28	27	27	26	24
15; 20 кп	34—46	34—48	27	26	25	26	25	24
20	36—50	36—51	26	25	24	25	24	24
25	—	40—55	—	24	23	—	23	22
30	—	45—60	—	22	21	—	21	20

Continued

Grade	Type of drawing							
	ВГ	Г and Н	ВГ	Г	Н	ВГ	Г	Н
	tensile strength, kg/mm^2		elongation, %, minimum					
			cold-rolled sheets			hot-rolled sheets		
35	—	50—65	—	20	19	—	19	18
40	—	52—67	—	—	18	—	—	17
45	—	55—70	—	—	16	—	—	15
50	—	55—73	—	—	14	—	—	13

ERICKSEN CUPPING TEST SPECIFICATIONS

ГОСТ 914-56

Thickness of sheet, mm	Grade of steel and type of drawing				
	05 кп 08 кп 08 пс 10 кп ВГ	05 кп 08 кп 08 пс 10 кп Г	05 кп 08 кп 08 пс 10 кп Н	10 15 кп 15 20 кп 20 ВГ	10 15 кп 15 20 кп 20 Г
	Depth of indentation, mm, minimum				
0.5	9.0	8.4	8.0	8.0	7.6
0.6	9.4	8.9	8.5	8.4	7.8
0.7	9.7	9.2	8.9	8.6	8.0
0.8	10.0	9.5	9.3	8.8	8.2
0.9	10.3	9.9	9.6	9.0	8.4
1.0	10.5	10.1	9.9	9.2	8.6
1.1	10.8	10.4	10.2	—	—
1.2	11.0	10.6	10.4	—	—
1.3	11.2	10.8	10.6	—	—
1.4	11.3	11.0	10.8	—	—
1.5	11.5	11.2	11.0	—	—
1.6	11.6	11.4	11.2	—	—
1.7	11.8	11.6	11.4	—	—
1.8	11.9	11.7	11.5	—	—
1.9	12.0	11.8	11.7	—	—
2.0	12.1	11.9	11.8	—	—

ALLOY STRUCTURAL SHEET STEEL

ГОСТ 1542-54

Mechanical Properties of Annealed or Tempered Sheets

Grade	Tensile strength, kg/mm^2	Elongation, δ_{10}, %, minimum
60Г	55—80	14
65Г	60—85	12
70Г	65—90	10
10Г2, 10Г2А	40—58	22
25ХГС, 25ХГСА	50—70	18
30ХГС, 30ХГСА	55—75	16
12Г2А	50—65	18

Cupping Test Specifications

Thickness of sheet, mm	Grade of steel			
	10Г2 and 10Г2А	12Г2А	25ХГСА	30ХГСА
	Depth of indentation, mm, minimum			
0.5	7.3	7.0	7.0	7.0
0.6	7.7	7.4	7.4	7.2
0.7	8.0	7.6	7.6	7.5
0.8	8.5	7.8	7.8	7.7
0.9	8.8	8.0	8.0	8.0
1.0	9.0	8.2	8.2	8.2

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QUALITY CARBON STEEL PLATE

ГОСТ 1577-53

Mechanical Properties

Grade	Tensile strength, kg/mm^2	Elongation, %, δ_5	Grade	Tensile strength, kg/mm^2	Elongation, %, δ_5
	minimum			minimum	
08кп	32	34	15Г	43	28
10кп-10	34	32	20Г	45	27
15	38	30	30Г	55	22
20	42	28	40Г	60	19
25	45	26	50Г	65	17
30	49	24	60Г	72	13
35	53	22	65Г	75	12
40	57	20	70Г	80	10
45	60	18	10Г2	45	28
50	64	17	30Г2	60	20
55	67	15	35Г2	63	19
60	70	13	40Г2	67	17
65	73	12	45Г2	70	15
70	76	11	50Г2	75	13

STAINLESS, ACID- AND SCALE-RESISTING SHEET STEEL

ГОСТ 5582-50

Grade	Tensile strength, kg/mm^2	Elongation, $l=5.65\sqrt{F}$, %	Heat treatment (recommended)
1X13	40	21	Temper at 740—780° C, cool in furnace
2X13	50	20	Ditto
3X13	50	15	Ditto
4X13	60	15	Ditto
X17H2	110	10	Harden at 950—975° C, cool in oil, temper at 275—350°
X17	50	18	Temper at 760—780° C, cool in air or in furnace
X28	50	17	Harden at 760—780° C, cool in water or air
X25	54	17	Ditto
0X18H9	54	45	Harden at 1050—1100° C, cool in water or air
1X18H9	55	35	Harden at 1080—1120° C, cool in water or air
2X18H9	60	38	Harden at 1100—1150° C, cool in water
1X18H9T	54	40	Harden at 1050—1120° C, cool in water or air

Continued

Grade	Tensile strength, kg/mm^2	Elongation, $l=5.65\sqrt{F}$, %	Heat treatment (recommended)
Х18Н11Б	54	40	Harden at 1080–1130° C, cool in water or air
Х18Н12М2Т	54	35	Harden at 1080–1130° C, cool in water or air
Х18Н12М3Т	54	35	Harden at 1080–1130° C, cool in water or air
Х13Н4Г9	65	40	Harden at 1100–1150° C, cool in water
Х23Н13	55	35	Ditto
Х23Н18	58	40	Ditto
Х20Н14С2	60	40	Ditto
Х25Н20С2	55	35	Ditto

SHEET STEEL FOR ELECTRICAL MANUFACTURING INDUSTRY

ГОСТ 802-58

Magnetic Induction and Specific Losses

Grade	Thickness of sheet, mm	Magnetic induction in gausses at field intensity, At/cm					Specific losses, W/kg	
		B10	B25	B50	B100	B300	P10/50	P15/50
		minimum					maximum	
		HOT-ROLLED STEEL						
Э11	1.0	—	15 300	16 300	17 600	20 000	5.8	13.4
Э12	1.0	—	15 000	16 200	17 500	19 800	5.5	12.5
Э11	0.50	—	15 300	16 400	17 600	20 000	3.3	7.7
Э12	0.50	—	15 000	16 200	17 500	19 800	3.2	7.5
Э13	0.50	—	15 000	16 200	17 500	19 800	2.8	6.5
Э21	0.50	—	14 800	15 900	17 300	19 500	2.5	6.1
Э22	0.50	—	14 800	15 900	17 300	19 500	2.2	5.3
Э31	0.50	—	14 600	15 700	17 200	19 400	2.5	4.4
Э32	0.50	—	14 600	15 700	17 100	19 200	1.8	3.9
Э31	0.35	—	14 600	15 700	17 100	19 200	1.6	3.6
Э32	0.35	—	14 600	15 700	17 100	19 200	1.4	3.2

Э41	0.50	13 000	14 600	15 700	17 000	19 000	1.55	3.5
Э42	0.50	12 900	14 500	15 600	16 900	18 900	1.4	3.1
Э43	0.50	12 900	14 400	15 500	16 900	18 900	1.25	2.9
Э43A	0.50	12 900	14 400	15 500	16 900	18 900	1.15	2.7
Э41	0.35	13 000	14 600	15 700	17 000	19 000	1.35	3.0
Э42	0.35	12 900	14 500	15 600	16 900	18 900	1.2	2.8
Э43	0.35	12 900	14 400	15 500	16 900	18 900	1.05	2.5
Э43A	0.35	12 900	14 400	15 500	16 900	18 900	0.9	2.2
COLD-ROLLED ROUGH-GRAINED STEEL								
Э1100	0.50	—	15 300	16 400	17 600	20 000	3.3	7.5
Э1200	0.50	—	15 300	16 400	17 600	20 000	2.8	6.5
Э1300	0.50	—	15 500	16 400	17 600	20 000	2.5	5.8
Э3100	0.50	—	15 000	16 000	17 300	19 600	1.7	3.7
Э3200	0.50	—	14 800	15 800	17 200	19 500	1.5	3.4
COLD-ROLLED FINE-GRAINED STEEL								
Э310	0.50	16 000	17 500	18 300	19 100	19 800	1.1	2.45
Э320	0.50	16 500	18 000	18 700	19 200	20 000	0.95	2.1
Э330	0.50	17 000	18 500	19 000	19 500	20 000	0.8	1.75
Э310	0.35	16 000	17 500	18 300	19 100	19 800	0.8	1.75
Э320	0.35	16 500	18 000	18 700	19 200	20 000	0.7	1.5
Э330	0.35	17 000	18 500	19 000	19 500	20 000	0.6	1.3
Э330A	0.35	17 000	18 500	19 000	19 500	20 000	0.5	1.1

HIGH-ALLOY STAINLESS, ACID- AND SCALE-RESISTING PLATE STEEL

ГОСТ 7350-55

Grade	Tensile strength, kg/mm²	Elongation, $l=5.65\sqrt{F}$, %	Heat treatment (recommended)
	minimum		
08X13	45	28	High temper at 680—780°C, cool in furnace or air
1X13	47	21	Ditto
2X13	50	20	Ditto
X17 and X17T	45	18	Anneal at 760—780°C, cool in air or furnace
0X18H9	54	45	Harden at 1050—1100°C, cool in water or air
1X18H9	55	38	Harden at 1080—1120°C, cool in water
2X18H9	60	35	Harden at 1100—1500°C, cool in water
X18H11Б	54	38	Harden at 1080—1130°C, cool in water or air
1X18H9T	55	38	Harden at 1030—1080°C, cool in water or air
X18H12M2T	54	37	Harden at 1050—1100°C, cool in water or air
X23H13	56	34	Harden at 1100—1150°C, cool in water
X23H18	56	34	Harden at 1080—1130°C, cool in water

BASIC ASSORTMENT OF FERROUS ROLLED STOCK

SQUARE BILLETS

ГОСТ 4693-57

Side of square	Diameter of rounded corners	Permissible deviation for side of square	
mm			
40; 45; 50	7	+1.0	−1.5
56; 60; 63; 70	9	+1.3	−2.0
75; 80; 85; 90	12	+1.6	−2.5
95; 100; 105	15	+1.8	−3.0
110; 115; 120; 125	18	+2.0	−3.5
130; 140; 150	21	+2.4	−4.0
160; 170; 180	25	+3.0	−5.0
190; 200	30	+4.0	−6.0
210; 220; 240; 250	35	+5.0	−7.0

Length of billets: ordinary quality steel,

side of square 40—100 mm . . . . 3—9 m

side of square 105—150 mm . . . . 2—8 m

side of square over 150 mm . . . . 1—6 m

quality steel, all dimensions . . . . 1—6 m

Billets can be supplied in full lengths and multiples of lengths.

ROUND HOT-ROLLED STEEL

ГОСТ 2590-57

Diameter	Permissible deviation			
	for ordinary tolerance of rolling		for high tolerance of rolling	
mm				
5; 5.6; 6.3; 6.5; 7; 8; 9	+0.3	−0.5	+0.1	−0.3
10; 11; 12; 13; 14; 15; 16; 17; 18; 19	+0 3	−0.5	+0.2	−0.3
20; 21; 22; 24; 25	+0.4	−0.5	+0.2	−0.4
26; 28; 30; 32; 34; 36; 38; 40; 42; 45; 48	+0.4	−0.7	+0.2	−0.6
50; 53; 56	+0.4	−1.0	+0.2	−0.9
60; 63; 65; 70; 75	+0.5	−1.1	+0.3	−1.0
80; 85; 90; 95	+0.5	−1.3	+0.4	−1.2
100; 105; 110	+0.6	−1.7	+0.5	−1.5
120; 125	+0.8	−2.0	+0.6	−1.8
130; 140; 150	+0.8	−2.0	+0.6	−2.0
160; 170; 180; 190; 200	+0.9	−2.5	-	
210; 220; 240; 250	+1.2	−3.0	-	

Length of bars, ordinary quality steel

diameter up to 25 mm	5—10 m
diameter 26—50 mm incl.	4—9 m
diameter 53—110 mm incl.	4—7 m
diameter over 110 mm	3—6 m
quality steel of all dimensions	from 2 to 6 m

Bars can be supplied in full lengths and multiples of lengths.

SQUARE HOT-ROLLED STEEL

ГОСТ 2591-57

Side of square	Permissible deviation for side of square			
	for ordinary tolerance of rolling		for high tolerance of rolling	
	mm			
5; 6; 7; 8; 9	+0.3	−0.5	+0.1	−0.3
10; 11; 12; 13; 14; 15; 16; 17; 18; 19	+0.3	−0.5	+0.2	−0.3
20; 21; 22; 24; 25	+0.4	−0.5	+0.2	−0.4
26; 28; 30; 32; 34; 36; 38; 40; 42; 45; 48	+0.4	−0.7	+0.2	−0.6
50; 53; 56	+0.4	−1.0	+0.2	−0.9
60; 63; 65; 70; 75	+0.5	−1.1	+0.3	−1.0
80; 85; 90; 95	+0.5	−1.3	+0.4	−1.2
100; 105; 110	+0.6	−1.7	+0.5	−1.5
120; 125	+0.8	−2.0	+0.6	−1.8
130; 140; 150	+0.8	−2.0	+0.6	−2.0
160; 170; 180; 190; 200	+0.9	−2.5	—	
210; 220; 240; 250	+1.2	−3.0	—	

Curvature per running metre shall not exceed 5 mm.
Length of bars:

ordinary quality steel,

side of square up to 25 mm	5—10 m
side of square 26—50 mm	4—9 m
side of square 53—110 mm	4—7 m
side of square over 110 mm	3—6 m
bars of quality steel	2—6 m

Bars can be supplied in full lengths or multiples of lengths.

HEXAGONAL HOT-ROLLED STEEL

ГОСТ 2879-57

Diameter of inscribed circle	Permissible deviation	
	for ordinary tolerance of rolling	for high tolerance of rolling
mm		
8	+0.3 −0.5	+0.1 −0.3
9		
10	+0.3 −0.5	+0.2 −0.3
11		
12		
13		
14		
15		
16		
17		
18		
19		
20	+0.4 −0.5	+0.2 −0.4
21		
22		
24		
25		
26	+0.4 −0.7	+0.2 −0.6
27		
28		
30		

Diameter of inscribed circle	Permissible deviation	
	for ordinary tolerance of rolling	for high tolerance of rolling
mm		
32	+0.4 −0.7	+0.2 −0.6
34		
36		
38		
40		
42		
45		
48		
50	+0.4 −1.0	+0.2 −0.9
53		
56		
60	+0.5 −1.1	+0.3 −1.0
63		
65		
70		
75		
80	+0.5 −1.3	+0.4 −1.2
85		
90		
95		
100	+0.6 −1.7	+0.5 −1.5

Supplied in bars of 2—6 m in length, and also in full lengths and multiples of lengths.

HOT-ROLLED STEEL STRIP FOR SPRINGS

ГОСТ 7419-55

Width	Thickness																
	mm																
35	3	3.5	4	4.5	5	5.5	6	6.5	—	—	—	—	—	—	—	—	—
40	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	—	—	—	—	—	—
45	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	9	—	—	—	—	—
50	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	9	10	—	—	—	—
55	—	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	9	10	11	12	—	—
60	—	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	9	10	11	12	—	—
63	—	—	—	—	—	—	—	6.5	—	—	8	—	10	11	—	—	—
65	—	—	4	4.5	5	5.5	6	6.5	7	7.5	8	9	10	11	12	14	—
70	—	—	4	4.5	5	5.5	6	6.5	7	7.5	8	9	10	11	12	14	—
75	—	—	—	—	5	5.5	6	6.5	7	7.5	8	9	10	11	12	14	—
76	—	—	—	—	—	—	—	6.5	7	—	8	—	10	—	—	—	—
80	—	—	—	—	5	5.5	6	6.5	7	7.5	8	9	10	11	12	14	—
89	—	—	—	—	—	—	—	—	—	—	—	—	10	—	12	—	—
90	—	—	—	—	5	5.5	6	6.5	7	7.5	8	9	10	11	12	14	—
100	—	—	—	—	—	—	6	6.5	7	7.5	8	9	10	11	12	14	16
102	—	—	—	—	—	—	—	—	—	—	—	—	10	—	12	—	16
110	—	—	—	—	—	—	6	6.5	7	7.5	8	9	10	11	12	14	16
120	—	—	—	—	—	—	6	6.5	7	7.5	8	9	10	11	12	14	16
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	14	16
130	—	—	—	—	—	—	6	6.5	7	7.5	8	9	10	11	12	14	16
140	—	—	—	—	—	—	6	6.5	7	7.5	8	9	10	11	12	14	16
150	—	—	—	—	—	—	—	—	7	7.5	8	9	10	11	12	14	16

Thickness, mm	4	5	6	7	8	9	10	11	12	14	16
Width, mm	Theoretical weight per										
12	0.38	0.47	0.57	0.66	0.75	—	—	—	—	—	—
14	0.44	0.55	0.66	0.77	0.88	—	—	—	—	—	—
16	0.50	0.63	0.75	0.88	1.00	1.15	1.26	—	—	—	—
18	0.57	0.71	0.85	0.99	1.13	1.27	1.41	—	—	—	—
20	0.63	0.79	0.94	1.10	1.26	1.41	1.57	1.73	1.88	—	-
22	0.69	0.86	1.04	1.21	1.38	1.55	1.73	1.90	2.07	—	—
25	0.79	0.98	1.18	1.37	1.57	1.77	1.96	2.16	2.36	2.75	3.14
28	0.88	1.10	1.32	1.54	1.76	1.98	2.20	2.42	2.64	3.08	3.52
30	0.94	1.18	1.41	1.65	1.88	2.12	2.36	2.59	2.83	3.36	3.77
32	1.01	1.25	1.50	1.76	2.01	2.26	2.54	2.76	3.01	3.51	4.02
36	1.13	1.41	1.69	1.97	2.26	2.51	2.82	3.11	3.39	3.95	4.52
40	1.26	1.57	1.88	2.20	2.51	2.83	3.14	3.45	3.77	4.40	5.02
45	1.41	1.77	2.12	2.47	2.83	3.18	3.53	3.89	4.24	4.95	5.65
50	1.57	1.96	2.36	2.75	3.14	3.53	3.93	4.32	4.71	5.50	6.28
56	1.76	2.20	2.64	3.08	3.52	3.95	4.39	4.83	5.27	6.15	7.03
60	1.88	2.36	2.83	3.30	3.77	4.24	4.71	5.18	5.65	6.59	7.54
63	1.98	2.47	2.97	3.46	3.95	4.45	4.94	5.44	5.93	6.92	7.91
65	2.04	2.55	3.06	3.57	4.08	4.59	5.10	5.61	6.12	7.14	8.16
70	2.20	2.75	3.30	3.85	4.40	4.95	5.50	6.04	6.59	7.89	8.79
75	2.36	2.94	3.53	4.12	4.71	5.30	5.89	6.48	7.07	8.24	9.42

STEEL STRIP

103-57

18	20	22	25	28	30	32	36	40	45	50	56	60
linear metre, kg												
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
4.24	4.71	—	—	—	—	—	—	—	—	—	—	—
4.52	5.02	—	—	—	—	—	—	—	—	—	—	—
5.09	5.65	—	—	—	—	—	—	—	—	—	—	—
5.65	6.28	6.91	7.85	8.79	—	—	—	—	—	—	—	—
6.36	7.07	7.77	8.83	9.89	10.60	11.30	12.72	—	—	—	—	—
7.07	7.85	8.64	9.81	10.99	11.78	12.56	14.13	—	—	—	—	—
7.91	8.79	9.67	10.99	12.31	13.19	14.07	15.82	—	—	—	—	—
8.48	9.42	10.36	11.78	13.19	14.13	15.07	16.95	18.84	21.20	—	—	—
8.90	9.69	10.88	12.36	13.85	14.34	15.82	17.80	19.78	22.25	—	—	—
9.19	10.21	11.23	12.76	14.29	15.31	16.33	18.37	20.41	22.96	—	—	—
9.89	10.99	12.09	13.74	15.39	16.49	17.58	19.78	21.98	24.73	—	—	—
10.60	11.78	12.95	14.72	16.49	17.66	18.94	21.19	23.55	26.49	—	—	—

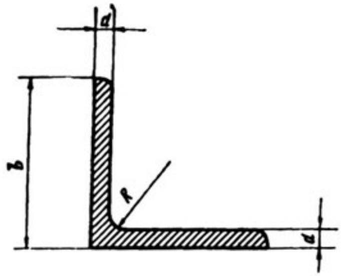
Thickness, mm	4	5	6	7	8	9	10	11	12	14	16	18
Width, mm	Theoretical weight per											
80	2.51	3.14	3.77	4.40	5.02	5.65	6.28	6.91	7.54	8.79	10.05	11.30
85	2.67	3.34	4.00	4.67	5.34	6.01	6.67	7.34	8.01	9.34	10.68	12.01
90	2.83	3.53	4.24	4.95	5.65	6.36	7.07	7.77	8.48	9.89	11.30	12.72
95	2.98	3.73	4.47	5.22	5.97	6.71	7.46	8.20	8.95	10.44	11.93	13.42
100	3.14	3.93	4.71	5.50	6.28	7.07	7.85	8.64	9.42	10.99	12.56	14.13
105	3.30	4.12	4.95	5.77	6.59	7.42	8.24	9.07	9.89	11.54	13.19	14.84
110	3.45	4.32	5.18	6.04	6.91	7.77	8.64	9.50	10.36	12.09	13.82	15.54
120	3.77	4.71	5.65	6.59	7.54	8.48	9.42	10.36	11.30	13.19	15.07	16.96
125	3.93	4.91	5.89	6.67	7.85	8.83	9.81	10.79	11.78	13.74	15.70	17.66
130	4.08	5.10	6.12	7.14	8.16	9.18	10.21	11.23	12.25	14.29	16.33	18.87
140	4.40	5.50	6.59	7.69	8.79	9.89	10.99	12.09	13.19	15.39	17.58	19.78
150	4.71	5.89	7.07	8.24	9.42	10.60	11.78	12.95	14.13	16.49	18.84	21.20
160	5.02	6.28	7.54	8.79	10.05	11.30	12.56	13.82	15.07	17.58	20.10	22.61
170	5.34	6.67	8.01	9.34	10.68	12.01	13.35	14.68	16.01	18.68	21.35	24.02
180	5.65	7.07	8.48	9.89	11.30	12.72	14.13	15.54	16.96	19.78	22.61	25.43
190	5.97	7.46	8.95	10.44	11.93	13.42	14.92	16.41	17.90	20.88	23.86	26.85
200	6.28	7.85	9.42	10.99	12.56	14.13	15.70	17.27	18.84	21.98	25.12	28.26

Steel strip is supplied in the following lengths:

weight per metre up to 19 kg	3—9 m
weight per metre 19—60 kg	3—7 m
weight per metre over 60 kg	3—5 m

Continued

20	22	25	28	30	32	36	40	45	50	56	60
linear metre, kg											
12.56	13.82	15.70	17.58	18.04	20.04	22.61	25.12	28.26	31.40	35.17	—
13.35	14.68	16.68	18.68	20.02	21.35	24.02	26.69	30.03	33.36	37.36	40.04
14.13	15.54	17.66	19.78	21.20	22.65	25.43	28.26	31.79	35.33	39.56	42.39
14.92	16.41	18.84	20.88	22.37	23.86	26.85	29.83	33.56	37.29	41.76	44.75
15.70	17.27	19.63	21.98	23.55	25.12	28.26	31.40	35.33	39.25	43.96	47.10
16.49	18.18	20.61	23.08	24.73	26.37	29.67	32.97	37.09	41.21	46.16	49.46
17.27	19.00	21.59	24.18	25.91	27.63	31.09	34.54	38.86	43.18	48.35	51.81
18.84	20.72	23.55	26.38	28.26	30.14	33.91	37.68	42.39	47.10	52.75	56.52
19.63	21.59	24.53	27.48	29.44	31.40	35.32	39.25	44.16	49.06	54.95	58.88
20.41	22.45	25.51	28.57	30.62	32.65	36.73	40.82	45.92	51.03	57.14	61.23
21.98	24.18	27.48	30.77	32.97	35.17	39.56	43.96	49.46	54.95	61.54	65.94
23.55	25.91	29.44	32.97	35.33	37.68	42.39	47.10	52.99	58.88	65.94	70.65
25.12	27.63	31.40	35.17	37.63	40.19	45.22	50.24	56.52	62.80	70.33	75.36
26.09	29.36	33.36	37.37	40.04	42.70	48.04	53.38	60.05	66.73	74.73	80.07
28.26	31.09	35.33	39.56	42.39	45.22	50.87	56.52	63.59	70.65	79.12	84.78
29.83	32.81	37.29	41.76	44.75	47.72	53.69	59.66	67.12	74.58	83.52	89.49
31.40	34.54	39.25	43.96	47.10	50.24	56.52	62.80	70.65	78.50	87.92	94.20



STEEL ANGLES,

ГОСТ

Flange width, mm	Flange										
	3	3.5	4	4.5	5	5.5	6	6.5	7	8	9
	Theoretical weight per										
20	0.89	—	1.15	—	—	—	—	—	—	—	—
25	1.12	—	1.46	—	—	—	—	—	—	—	—
28	1.27	—	—	—	—	—	—	—	—	—	—
32	1.46	—	1.91	—	—	—	—	—	—	—	—
36	1.65	—	2.16	—	—	—	—	—	—	—	—
40	1.85	—	2.42	—	—	—	—	—	—	—	—
45	2.08	—	2.73	—	3.37	—	—	—	—	—	—
50	2.32	—	3.05	—	3.77	—	—	—	—	—	—
56	—	3.03	3.44	—	4.25	—	—	—	—	—	—
63	—	—	3.90	—	4.81	—	5.72	—	—	—	—
70	—	—	—	4.87	5.38	—	6.39	—	7.39	8.37	—

EQUAL LEGS

8509-57

thickness, mm											
10	11	12	13	14	16	18	20	22	25	28	30
linear metre, kg											
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–

Flange width, mm	Flange										
	3	3.5	4	4.5	5	5.5	6	6.5	7	8	9
	Theoretical weight per										
75	—	—	—	—	5.80	—	6.89	—	7.96	9.02	10.1
80	—	—	—	—	—	6.78	7.36	—	8.51	9.65	—
90	—	—	—	—	—	—	8.33	—	9.64	10.9	12.2
100	—	—	—	—	—	—	—	10.1	10.8	12.2	—
110	—	—	—	—	—	—	—	—	17.9	13.5	—
125	—	—	—	—	—	—	—	—	—	15.5	17.3
140	—	—	—	—	—	—	—	—	—	—	19.4
160	—	—	—	—	—	—	—	—	—	—	—
180	—	—	—	—	—	—	—	—	—	—	—
200	—	—	—	—	—	—	—	—	—	—	—
220	—	—	—	—	—	—	—	—	—	—	—
250	—	—	—	—	—	—	—	—	—	—	—

Length of shapes:

angles Nos. 2—4 incl.	4—9 m
angles Nos. 9—14 incl.	4—19 m
angles Nos. 4.5—8 incl.	4—12 m
angles Nos. 16 and over	6—19 m

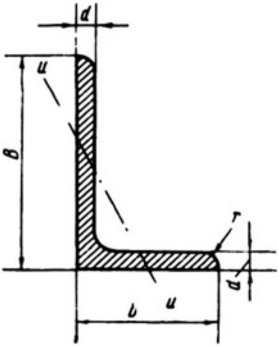
Shapes can be supplied in full lengths and multiples of lengths.

Continued

thickness, mm											
10	11	12	13	14	16	18	20	22	25	28	30
linear metre, kg											
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
15.1	—	17.9	—	20.6	23.3	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—
19.1	—	22.7	—	26.2	29.6	—	—	—	—	—	—
21.5	—	25.5	—	—	—	—	—	—	—	—	—
24.7	27.0	29.4	—	34	38.5	43	47.4	—	—	—	—
—	30.5	33.1	—	—	—	—	—	—	—	—	—
—	—	37	39.9	42.8	48.7	—	60.1	—	74	—	87.6
—	—	—	—	47.4	53.8	—	—	—	—	—	—
—	—	—	—	—	61.5	68.9	76.1	83.3	94	104.5	111.4

STEEL ANGLES,

ГОСТ



Width of flanges, mm	Flange				
	3	3.5	4	4.5	5
	Theoretical weight per				
25×16	0.91	–	–	–	–
32×20	1.17	–	1.52	–	–
40×25	1.48	–	1.94	–	–
45×28	1.68	–	2.20	–	–
50×32	1.90	–	2.49	–	–
56×36	–	2.48	2.81	–	3.46
63×40	–	–	3.17	–	3.91
70×45	–	–	–	3.98	4.39
75×50	–	–	–	–	4.79
80×50	–	–	–	–	4.99
90×56	–	–	–	–	–
100×63	–	–	–	–	–
110×70	–	–	–	–	–
125×80	–	–	–	–	–
140×90	–	–	–	–	–
160×100	–	–	–	–	–
180×110	–	–	–	–	–
200×125	–	–	–	–	–
250×160	–	–	–	–	–

Lengths of shapes:

angles Nos. 2.5/1.6—5/3.2	4—9 m
angles Nos. 5.6/3.6—9/5.6	4—12 m
angles Nos. 10/6.3—16/10	4—19 m
angles Nos. 18/11 and over	6—19 m

Shapes can be supplied in full lengths and multiples of lengths.

UNEQUAL LEGS

8510-57

thickness, mm												
5.5	6	6.5	7	8	9	10	11	12	14	16	18	20
linear metre, kg												
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	4.63	—	—	6.03	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—
—	5.69	—	—	7.43	—	—	—	—	—	—	—	—
—	5.92	—	—	—	—	—	—	—	—	—	—	—
6.17	6.70	—	—	8.77	—	—	—	—	—	—	—	—
—	7.53	—	8.70	9.87	—	12.1	—	—	—	—	—	—
—	—	8.98	9.64	10.9	—	—	—	—	—	—	—	—
—	—	—	11	12.5	—	15.5	—	18.3	—	—	—	—
—	—	—	—	14.1	—	17.5	—	—	—	—	—	—
—	—	—	—	—	18	19.8	—	23.6	27.3	—	—	—
—	—	—	—	—	—	22.2	—	26.4	—	—	—	—
—	—	—	—	—	—	—	27.4	29.7	34.4	39.1	—	—
—	—	—	—	—	—	—	—	37.9	—	49.9	55.8	61.7

HOT-ROLLED CARBON STEEL, DEFORMED BARS FOR CONCRETE REINFORCEMENT

Dimensions of Bars

ГОСТ 5781-58

Section number (rated diameter, mm)	d		d_1	h	l	a	b	Rated area of section, cm²	Theoretical weight per linear metre, kg
	nominal	permissible deviation							
	mm								
10	9.3	+0.3 −0.5	11.3	1.0	7	1.5	1.0	0.78	0.62
12	11		13.5	1.25	7	2.0	1.0	1.13	0.89
14	13		15.5	1.25	7	2.0	1.0	1.54	1.21
16	15		18.0	1.5	8	2.0	1.0	2.01	1.58
18	17		20.0	1.5	8	2.0	1.5	2.54	2.0
20	19		22.0	1.5	8	2.0	1.5	3.14	2.47
22	21	+0.4 −0.5	24.0	1.5	8	2.0	1.5	3.80	2.98
25	24		27.0	1.5	8	2.0	1.5	4.91	3.85
28	26.5	+0.4 −0.7	30.5	2.0	9	2.5	1.5	6.16	4.83
32	30.5		34.5	2.0	10	3.0	2.0	8.04	6.31
36	34.5		39.5	2.5	12	3.0	2.0	10.18	7.99
40	38.5		43.5	2.5	12	3.0	2.0	12.57	9.87
45	43		49.0	3.0	15	3.5	2.5	15.90	12.48
50	48		54.0	3.0	15	3.5	2.5	19.63	15.41
55	53	+0.4 −1.0	59.0	3.0	15	4.0	2.5	23.76	18.65
60	58		64.0	3.0	15	4.0	2.5	28.27	22.19
70	68	+0.5 −1.1	74.0	3.0	15	4.5	2.5	38.48	30.21
80	77.5		83.5	3.0	15	4.5	2.5	50.27	39.46
90	87.5	+0.5 −1.3	93.5	3.0	15	5.0	2.5	63.62	49.94

Bars are supplied in lengths of 6—12 m or in full lengths.

Bars are made of steel, grades Б Ст. 5 and Ст. 5

Note. d—inner diameter of bar; d_1—outer diameter of bar; h—height of projection; l—distance between projections; a—width of rib; b—width of projection.

LOW-ALLOY STEEL DEFORMED BARS FOR REINFORCING SIMPLE AND PRESTRESSED CONCRETE

Low-alloy steel deformed bars are round bars with two longitudinal ribs and with projections arranged in spirals having a right turn on one side of the bar and a left turn on the other.

Dimensions

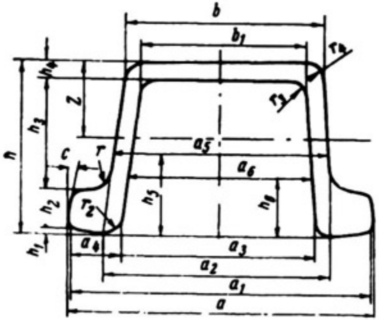
Section No. (rated diameter, mm)	Dimensions and permissible deviation, mm							Rated area of section, cm²	Theoretical weight per linear metre, kg
	d								
	nominal	permissible deviation	d_1	h	l	a	b		
6	5.75	+0.3 −0.5	6.75	0.5	5	1.0	0.5	0.288	0.222
7	6.75		7.75	0.5	5	1.0	0.5	0.385	0.302
8	7.5		9.0	0.75	5	1.25	0.75	0.503	0.395
9	8.5		10.0	0.75	5	1.25	0.75	0.636	0.50
10	9.3		11.3	1.0	7	1.5	1.0	0.785	0.62
12	11.0		13.5	1.25	7	2.0	1.0	1.13	0.89
14	13.0		15.3	1.25	7	2.0	1.0	1.54	1.21
16	15.0		18.0	1.5	8	2.0	1.0	2.01	1.58
18	17.0		20.0	1.5	8	2.0	1.5	2.54	2.00
20	19.0	+0.4 −0.5	22.0	1.5	8	2.0	1.5	3.14	2.47
22	21.0		24.0	1.5	8	2.0	1.5	3.80	2.98
25	24.0		27.0	1.5	8	2.0	1.5	4.91	3.85

Continued

Section No. (rated diameter, mm)	Dimensions and permissible deviation, mm							Rated area of section, cm²	Theoretical weight per linear metre, kg
	d		d_1	h	l	a	b		
	nominal	permissible deviation							
28	26.5	+0.4 −0.75	30.5	2.0	9	2.5	1.5	6.16	4.83
32	30.5		34.5	2.0	10	3.0	2.0	8.04	6.31
36	34.5		39.5	2.5	12	3.0	2.0	10.18	7.99
40	38.5		43.5	2.5	12	3.0	2.0	12.57	9.87

Bars are made of grade 25Г2С steel, the chemical composition and mechanical properties being in accordance with ГОСТ 5058-57.

Note. d—inner diameter of bar; d_1—outer diameter of bar; h—height of projection; l—distance between projections; a—width of rib; b—width of projection.


b
b1
r4
r3
h4
Z
h3
h
c
r
a5
a6
h5
h6
h2
r2
h1
a4
a3
a2
a1
a

SHAPES FOR MINE SUPPORTS

ГОСТ 5157-53

Dimensions, mm

Shape No.	a	a_1	a_2	a_3	a_4	a_5	a_6	b	b_1	h	h_1	h_2	h_3	h_4	h_5	h_6	r_1	r_2	r_3	r_4	c	Z
18A	131.0	130.5	96.0	84.0	23.5	—	82.1	85.0	71.0	77.0	2.0	18.0	49.0	8.0	—	10.0	9.0	10.0	7.0	5.0	1.0	39.1
18Б	132.5	131.8	90.5	78.5	27.0	82.1	—	71.0	59.0	86.0	2.5	14.5	60.0	9.0	37.0	—	5.0	7.0	9.0	9.0	1.0	42.6
28A	155.0	154.6	112.6	99.0	28.0	—	94.5	82.0	70.0	110.0	3.0	23.0	69.5	14.5	—	15.0	14.0	14.0	13.0	13.0	1.5	56.6
28Б	155.0	154.4	108.2	93.0	31.0	94.5	—	69.5	57.0	115.0	3.0	16.0	81.0	15.0	40.6	—	15.0	15.0	23.0	16.0	1.5	57.2

CHANNELS

ГОСТ 8240-56*)

Dimensions, Weight and Reference Data

Shape No	Weight per linear metre	Dimensions						Area of section	Reference data for axcs							Z₀
									X — X				Y—Y			
		h	b	d	t	R	r		I_X	W_X	i_X	S_X	I_Y	W_Y min.	i_Y	
	kg	mm						cm²	cm⁴	cm³	cm	cm³	cm⁴	cm³	cm	cm
5	4.84	50	32	4.4	7.0	6	2.5	6.16	22.8	9.10	1.92	5.59	5.61	2.75	0.954	1 16
6.5	5.90	65	36	4.4	7.2	6	2.5	7.51	48.6	15.0	2.54	9.00	8.70	3.68	1.08	1.24
8	7.05	80	40	4.5	7.4	6.5	2.5	8.98	89.4	22.4	3.16	13.3	12.8	4.75	1.19	1.31
10	8.59	100	46	4.5	7.6	7	3	10.9	174	34.8	3.99	20.4	20.4	6.46	1.37	1.44
12	10.4	120	52	4.8	7.8	7.5	3	13.3	304	50.6	4.78	29.6	31.2	8.52	1.53	1.54
14	12.3	140	58	4.9	8.1	8	3	15.6	491	70.2	5.60	40.8	45.4	11.0	1.70	1.67
14a	13.3	140	62	4.9	8.7	8	3	17.0	545	77.8	5.66	45.1	57.5	13.3	1.84	1.87

16	14.2	160	64	5.0	8.4	8.5	3.5	18.1	747	93.4	6.42	54.1	63.3	13.8	1.87	1.80
16a	15.3	160	68	5.0	9.0	8.5	3.5	19.5	823	103	6.49	59.4	78.8	16.4	2.01	2.00
18	16.3	180	70	5.1	8.7	9	3.5	20.7	1090	121	7.24	69.8	86.0	17.0	2.04	1.94
18a	17.4	180	74	5.1	9.3	9	3.5	22.2	1190	132	7.32	76.1	105	20.0	2.18	2.13
20	18.4	200	76	5.2	9.0	9.5	4	23.4	1520	152	8.07	87.8	113	20.5	2.20	2.07
20a	19.8	200	80	5.2	9.7	9.5	4	25.2	1670	167	8.15	95.9	139	24.2	2.35	2.28
22	21.0	220	82	5.4	9.5	10	4	26.7	2110	192	8.89	110	151	25.1	2.37	2.21
22a	22.6	220	87	5.4	10.2	10	4	28.8	2330	212	8.99	121	187	30.0	2.55	2.46
24	24.0	240	90	5.6	10.0	10.5	4	30.6	2900	242	9.73	139	208	31.6	2.60	2.42
24a	25.8	240	95	5.6	10.7	10.5	4	32.9	3180	265	9.84	151	254	37.2	2.78	2.67
27	27.7	270	95	6.0	10.5	11	4.5	35.2	4160	308	10.9	178	262	37.3	2.73	2.47
30	31.8	300	100	6.5	11.0	12	5	40.5	5810	387	12.0	224	327	43.6	2.84	2.52
33	36.5	330	105	7.0	11.7	13	5	46.5	7980	484	13.1	281	410	51.8	2.97	2.59
36	41.9	360	110	7.5	12.6	14	6	53.4	10820	601	14.2	350	513	61.7	3.10	2.68
40	48.3	400	115	8.0	13.5	15	6	61.5	15220	761	15.7	444	642	73.4	3.23	2.75

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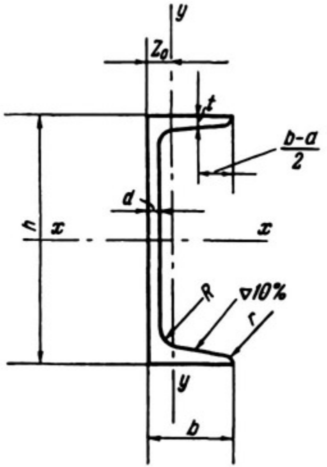
* Revised edition of November 1959.



h—height

b—width of flange

d—thickness of web

t—average thickness of flange

R—radius of inside curve

r—radius of flange curve

I—moment of inertia

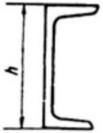
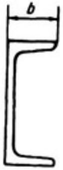
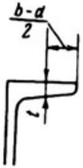
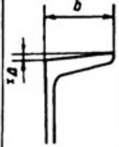
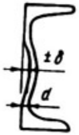
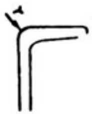
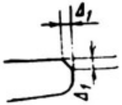
W—moment of resistance (section modulus)

i—radius of inertia

S—static moment of half-section

Z_0—distance of $Y-Y$ axis from outside surface of web

Permissible Deviations

Shape No	Heigh of flange	Width of flange	Thickness of flange	Weight per linear metre	Slope of outside surface of flange	Curvature of web in respect to height	Radius of outside curve	Rounding of outside corners of flanges
								
	mm			%		mm		
5—8 10—14 16—18 20—30 33—40	±1.5 ±2.0 ±2.5 ±3.0 ±3.5	±1.5 ±2.0 ±2.5 ±3.0 ±3.5	$-0.06t$ positive deviations unlimited	+3 —5	$\frac{\Delta}{b}\cdot 100 \leqslant$ $\leqslant 1.5$	$\delta \leqslant$ $\leqslant 0.15d$	for Nos 5—20 0.3 mm for Nos. 22—40 3 mm	for Nos. 5—20 $\Delta_1 \leqslant 0.3t$ for. Nos. 22—40 $\Delta_1 \leqslant 3$ mm

Channels are available in the following lengths:

Nos. 5—8	5—12 m
Nos. 10—18	5—19 m
Nos. 20—40	6—19 m

Curvature of channels shall not exceed 2 mm per linear metre.

I-Beams

ГОСТ 8239-56*)

Dimensions of Beams, Their Weight and Reference Data

Shape No.	Weight per 1 linear metre	Dimensions						Area of section	Reference data for axes						
									X — X				Y—Y		
		h	b	d	t	R	r		I_X	W_X	i_X	S_X	I_Y	W_Y	i_Y
	kg	mm						cm^2	cm^4	cm^3	cm	cm^3	cm^4	cm^3	cm
10	9.46	100	55	4.5	7.2	7	2.5	12.0	198	39.7	4.06	23.0	17.9	6.49	1.22
12	11.5	120	64	4.8	7.3	7.5	3	14.7	350	58.4	4.88	33.7	27.9	8.72	1.38
14	13.7	140	73	4.9	7.5	8	3	17.4	572	81.7	5.73	46.8	41.9	11.5	1.55
16	15.9	160	81	5.0	7.8	8.5	3.5	20.2	873	109	6.57	62.3	58.6	14.5	1.70
18	18.4	180	90	5.1	8.1	9	3.5	23.4	1 290	143	7.42	81.4	82.6	18.4	1.88
18a	19.9	180	100	5.1	8.3	9	3.5	25.4	1 430	159	7.51	89.8	114	22.8	2.12
20	21.0	200	100	5.2	8.4	9.5	4	26.8	1 840	184	8.28	104	115	23.1	2.07
20a	22.7	200	110	5.2	8.6	9.5	4	28.9	2 030	203	8.37	114	155	28.2	2.32
22	24.0	220	110	5.4	8.7	10	4	30.6	2 550	232	9.13	131	157	28.6	2.27
22a	25.8	220	120	5.4	8.9	10	4	32.8	2 790	254	9.22	143	206	34.3	2.50

24	27.3	240	115	5.6	9.5	10.5	4	34.8	3 460	289	9.97	163	198	34.5	2.37
24a	29.4	240	125	5.6	9.8	10.5	4	37.5	3 800	317	10.1	178	260	41.6	2.63
27	31.5	270	125	6.0	9.8	11	4.5	40.2	5 010	371	11.2	210	260	41.5	2.54
27a	33.9	270	135	6.0	10.2	11	4.5	43.2	5 500	407	11.3	229	337	50.0	2.80
30	36.5	300	135	6.5	10.2	12	5	46.5	7 080	472	12.3	268	337	49.9	2.69
30a	39.2	300	145	6.5	10.7	12	5	49.9	7 780	518	12.5	292	436	60.1	2.95
33	42.2	330	140	7.0	11.2	13	5	53.8	9 840	597	13.5	339	419	59.9	2.79
36	48.6	360	145	7.5	12.3	14	6	61.9	13 380	743	14.7	423	516	71.1	2.89
40	56.1	400	155	8.0	13.0	15	6	71.4	18 930	947	16.3	540	666	85.9	3.05
45	65.2	450	160	8.6	14.2	16	7	83.0	27 450	1220	18.2	699	807	101	3.12
50	76.8	500	170	9.5	15.2	17	7	97.8	39 290	1570	20.0	905	1040	122	3.26
55	89.8	550	180	10.3	16.5	18	7	114	55 150	2000	22.0	1150	1350	150	3.44
60	104	600	190	11.1	17.8	20	8	132	75 450	2510	23.9	1450	1720	181	3.60
65	120	650	200	12.0	19.2	22	9	153	101 400	3120	25.8	1800	2170	217	3.77
70	138	700	210	13.0	20.8	24	10	176	134 600	3840	27.7	2230	2730	260	3.94
70a	158	700	210	15.0	24.0	24	10	202	152 700	4360	27.5	2550	3240	309	4.01
70b	184	700	210	17.5	28.2	24	10	234	175 370	5010	27.4	2940	3910	373	4.09

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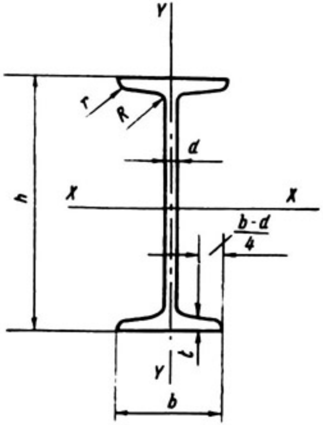
*) Revised edition of November 1959.



h—height

b—width of flange

d—thickness of web

t—average thickness of flange

R—radius of inside curve

r—radius of flange curve

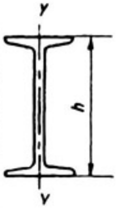
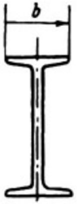
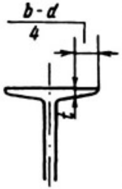
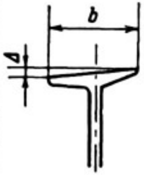
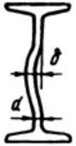
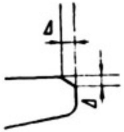
I—moment of inertia

W—moment of resistance (section modulus)

i—radius of inertia

S—static moment of half-section

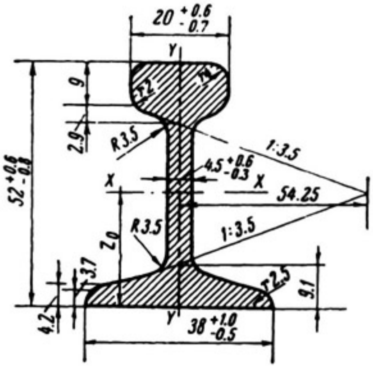
Permissible Deviations

Shape No.	Height of flange	Width of flange	Thickness of flange	Weight per linear metre	Slope of outside surface of flange	Curvature of web in respect to height	Rounding of outside corners of flanges
							
	mm			%		mm	
10—14 16—18 20—30 33—40 45—70	±2.0 ±2.5 ±3.0 ±3.5 ±4.0	±2.0 ±2.5 ±3.0 ±3.5 ±4.0	$-0.06t$ positive deviations unlimited	+3.0 −5.0	$\frac{\Delta}{b}\cdot 100 \leqslant$ $\leqslant 1.5$	$\delta \leqslant 0.15d$	for Nos. 10—24 incl $\Delta_1 \leqslant 0.3t$ Nos. for 27—70 $\Delta_1 \leqslant 3$ mm

Lengths of beams:

Nos. 10—18 . . . . 5—19 m
Nos. 20—70 . . . . 6—19 m

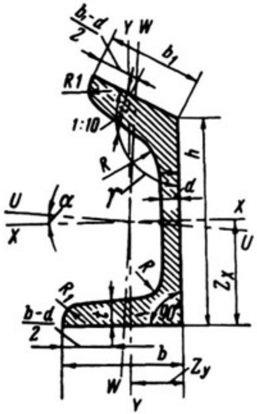
Maximum curvature of beams 2 mm per linear metre.


20 +0.6 -0.7
Y
r2
r2
9
2.9
R3.5
1:3.5
4.5 +0.6 -0.3
X
X
54.25
Z_0
R3.5
1:3.5
3.7
r2.5
9.1
4.2
Y
38 +1.0 -0.5
52 +0.6 -0.8

RAILWAY AND CRANE RAILS, TYPE P5

ГОСТ 5157-53

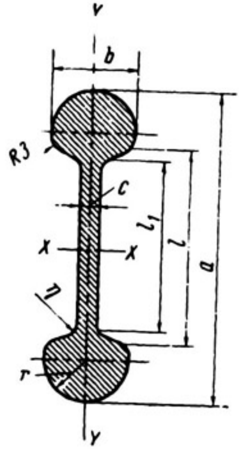
Theoretical weight per linear metre,	Cross-section area,	Axis X—X				Axis Y—Y	
		Moment of inertia, I_X,	Moment of resistance, W_X		Distance from centre of gravity to base, Z_0,	Moment of inertia, I_Y,	Moment of resistance, W_Y.
			top	bottom			
kg	cm²	cm⁴	cm³		cm	cm⁴	cm³
4.67	5.95	24.78	8.72	10.50	23.6	2.93	1.54


$\frac{b_1-d}{2}$
Y
W
b_1
R1
1:10
R
γ
h
d
U
α
X
X
U
Z_x
R
R_1
$\frac{b-d}{2}$
t
90°
b
Z_y
W
Y

CHANNELS WITH BENT FLANGES FOR TRUCKS

ГОСТ 5157-53

Section No.	Dimensions, mm									γ°	Permissible deviations, mm			γ°	Cross-section area, cm²	Theoretical weight per linear metre, kg
	h	b	b_1	d	t	$\frac{b-d}{2}$	$\frac{b_1-d}{2}$	R	R_1		h	b and b_1	d			
СП-10	100	55	40	9	11	23.0	15.5	11	5.5	123	±2	±1.5	$^{+0.7}_{-1.0}$	±30′	18.6	14.6
СП-12	120	60	45	11	13	24.5	17.0	13	6.5	126	±2	±1.5	$^{+0.7}_{-1.0}$	±30′	25.5	20.0


Y
b
R3
c
l_1
l
a
X
X
r_1
r
Y

DOUBLE-HEADED RAILS

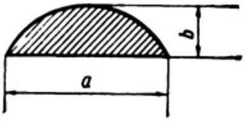
ГОСТ 5157-53

Dimensions							Permissible deviation			
a	b	c	l	l_1	r	r_1	a	b	c	l and l_1
mm										
130	30	7	88	78	15	4	±0.5	+0.4 −0.5	+0.4 −0.3	±0.8
160	40	8	105	92	20	5	±0.8	+0.4 −0.5	+0.4 −0.3	±1.0

Cross-section area, cm²	Theoretical weight per linear metre, kg	Axis X—X		Axis Y—Y
		moment of inertia, I_X, cm⁴	moment of resistance, W_X, cm³	moment of inertia, I_Y, cm⁴
17.8	14.00	361.7	56	7.34
28.8	22.60	903.4	113	22.4

SEMI-ROUND STEEL

ГОСТ 5157-53



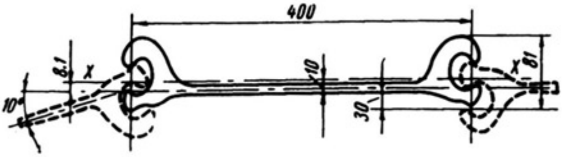
Dimensions		Permissible deviation		Area of section, cm^2	Theoretical weight per linear metre, kg
mm					
a	b	a	b		
15	5	±0.5	±0.5	0.54	0.43
18	6	±0.5		0.78	0.61
20	10	±0.5		1.57	1.23
22	7	±0.5		1.11	0.87
24	11	±0.5		2.02	1.58
25	8	±0.5		1.44	1.13
26	9	±0.5		1.70	1.33
27	13	±0.6	+0.4 −0.5	2.72	2.13
30	10	±0.6		2.17	1.70
30	14	±0.6		3.23	2.53
34	15	±0.7		4.28	3.36
35	11	±0.7		2.75	2.16
37	17	±0.7		4.82	3.78
40	12	±0.7		3.41	2.68
40	14	±0.7		4.08	3.20
45	13	±0.8		4.14	3.25
50	12	±0.8		4.17	3.28
50	16	±0.8	+0.4 −0.5	5.74	4.51
50	20	±0.8		7.47	5.81
60	20	±1.0		8.67	6.81
65	20	±1.0		9.28	7.20
100	10	±1.5	+0.4 −0.6	6.72	5.28
100	12	±1.5		8.09	6.35
120	12	±2.0		10.00	7.85

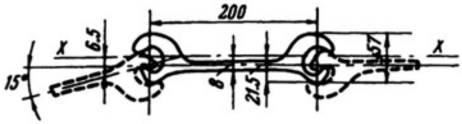
Length of shapes from 2 to 6 m.

STEEL SHAPES FOR INTERLOCKING PILING

ГОСТ 4781-55

A. **Interlocking flat shapes.** Principal use — cellular structures.

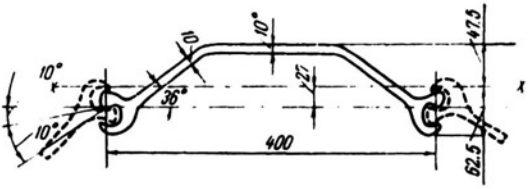

400
8.1
X
10°
10
30
X
81


200
X
6.5
15°
8
21.5
5.7
X

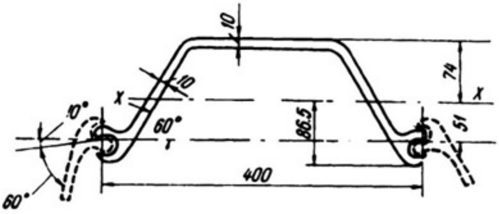
Shape	Area of section, F, cm²	Weight per linear metre, G, kg	Moment of inertia, I_X, cm⁴	Moment of resistance, W_X, cm³
Шп-1	82	64	332	73
Шп-2	39	30	80	28

Length of shape from 8 to 22 m.

B. Interlocking channels. Principal use—anti-seepage walls.



10°
10
47.5
10°
27
36°
x
10°
400
62.5

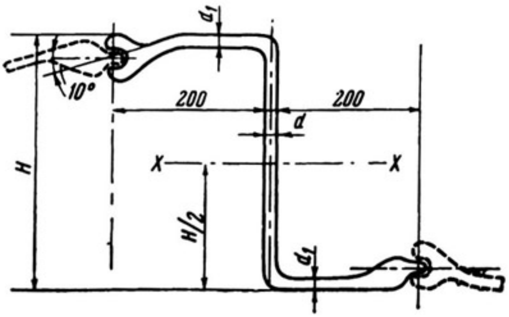


10
74
10
x
x
10°
86.5
51
60°
400
60°

Shape	Area of section, F, cm^2	Weight per linear metre, G, kg	Moment of inertia, I_X, cm^4	Moment of resistance, W_X, cm^3
Шк-1	64	50	730	114
Шк-2	74	58	2243	260

Length of shape from 8 to 22 m.

C. **Steel Zees** (ШД-3 and ШД-5). Principal use—supporting walls and piers



Shape	Height, H	Web thickness, d	Flange thickness, d_1	Area of section, F cm²	Weight per linear metre, G, kg	Moment of inertia, I_X, cm⁴	Moment of resistance, W_X, cm³
	mm						
ШД-3	240	9	10	78	61	7 600	630
ШД-5	320	12	14	119	93	20 100	1256

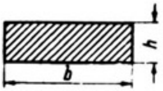
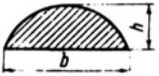
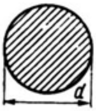
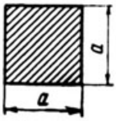
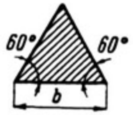
Length of shape from 8 to 25 m.

Shapes for interlocking piling are made of carbon steel, grades Ст. 3, Ст. 4 and Ст. 5 in accordance with ГОСТ 380-50, and low-alloy steel, grade 15ХСНД (НЛ-2) in accordance with ГОСТ 5058-57. On mutual agreement a maximum copper content of 0.4% is permissible.

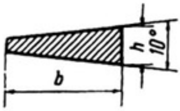
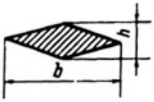
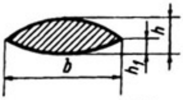
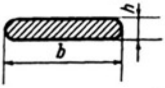
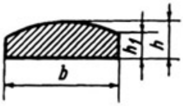
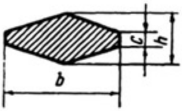
ROLLED STEEL OF SPECIAL SHAPES FOR FILES AND RASPS

ГОСТ 5210-50

Dimensions

Shape of section	Dimensions of cross-section, mm												
	b	9	12	15	18	22	26	30	35	40	40	45	45
	h	3	3.5	4	5	6	8	9	10	7	11	8	12
	b	12	15	18	22	26	30	35	40	45	—	—	—
	h	4	5	6	7	9	10	11	12	13	—	—	—
	d	4	5	6	8	11	13	16	19	22	—	—	—
	a	4	5	6	8	10	13	16	19	22	35	38	40
	b	7	9	11	13	14	15	18	21	24	27	30	—

Continued

Shape of section	Dimensions of cross-section, mm					
	b	12	18	22	26	30
	h	3.5	5	6	7	8
	b	12	18	22	26	
	h	3.5	5	6	7	
	b	12	18	22	26	
	h	3.5	5	6	7	$h_1 = \frac{1}{3} h$
	b	18	22	26		
	h	3	4	5		
	b	18	22	26		
	h	5	6	8		
	h_1	3	4	6		
	b	18	24			
	h	5	7			
	c	1.5	1.5			

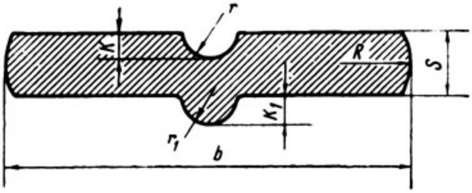
Rods are supplied in lengths of from 2 to 6 m.

Local plane curvature shall not exceed 6 mm per linear metre; local curvature along edge shall not exceed 2 mm per linear metre.

The shapes are made of steel У7, У7А, У10, У10А, У12, У12А, У13, У13А in accordance with ГОСТ 1435-54

GROOVED SPRING STEEL

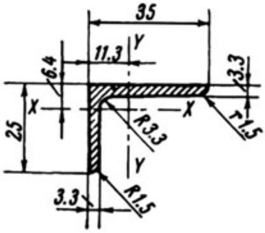
ГОСТ 7419-55



Width, b	Thickness, S	r, minimum	K	K₁	r₁, maximum	R
			mm			
63	10	5	4.5	3.75	3.75	20—40
63	13	5	4.5	3.75	3.75	
76	7	4	3.5	2.75	2.75	
76	10	5	4.5	3.75	3.75	
76	11	5	4.5	3.75	3.75	
76	13	5	4.5	3.75	3.75	
89	10	5	4.5	3.75	3.75	
89	13	5	4.5	3.75	3.75	
100	13	5	4.5	3.75	3.75	
110	13	5	4.5	3.75	3.75	
120	12	5	4.5	3.75	3.75	
120	13	5	4.5	3.75	3.75	

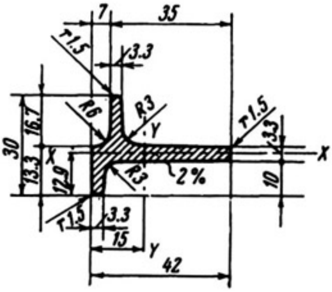
ROLLED SHAPES FOR WINDOW AND SKYLIGHT FRAMES OF INDUSTRIAL BUILDINGS

ГОСТ 7511-58



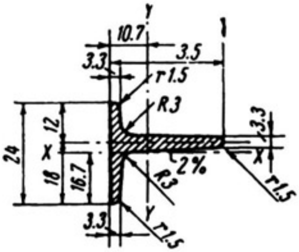
35
11.3
Y
6.4
3.3
X
X
25
R3.3
r1.5
Y
3.3
R1.5

Shape No. 1



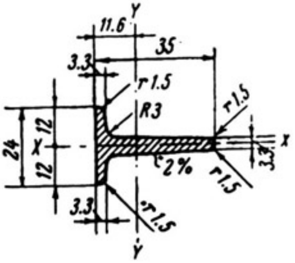
7
35
r1.5
3.3
R6
R3
Y
r1.5
3.3
30
16.7
13.3
X
12.9
R3
2%
10
X
r1.5
3.3
15
Y
42

Shape No. 2



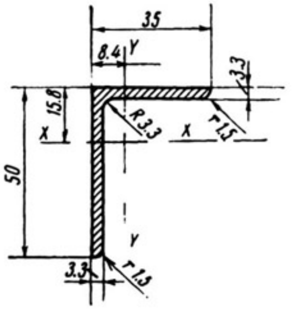
Y
10.7
3.5
3.3
r1.5
R3
24
12
X
18
16.7
3.3
X
2%
R3
r1.5
3.3
Y
r1.5

Shape No. 3

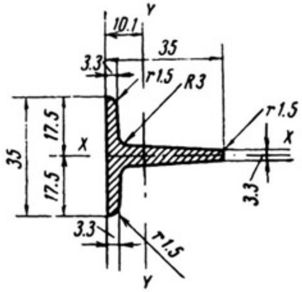


Y
11.6
35
3.3
r1.5
R3
r1.5
24
X
12
12
2%
3.3
x
r1.5
3.3
r1.5
Y

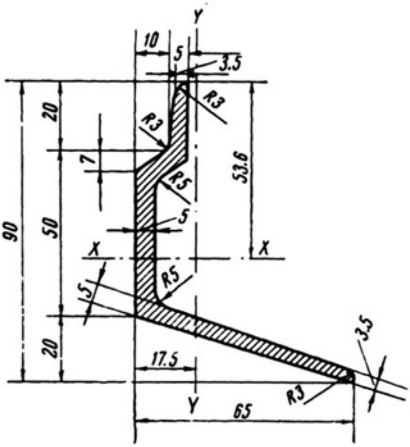
Shape No. 4


35
8.4
Y
3.3
15.8
R3.3
X
X
r1.5
50
Y
3.3
r1.5

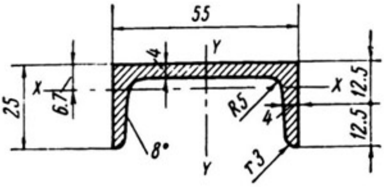
Shape No. 5


Y
10.1
35
3.3
r1.5
R3
r1.5
X
17.5
35
X
17.5
3.3
3.3
r1.5
Y

Shape No. 6


Y
10
5
3.5
R3
20
R3
7
R5
53.6
90
50
5
X
X
R5
5
20
17.5
3.5
R3
Y
65

Shape No. 7


55
Y
4
X
25
6.7
R5
X
12.5
4
12.5
8°
Y
r3

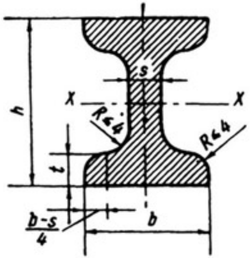
Shape No. 8

Lengths of shapes:

Nos. 1—6 . . . . 4—6 m

Nos. 7—8 . . . . . 6 m with permissible variation of + 30 mm

Local curvature shall not exceed 2 mm per linear metre and 6 mm for the entire length.



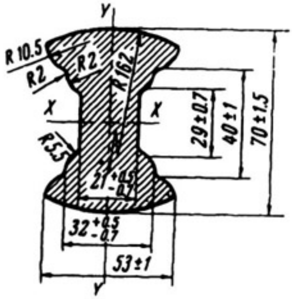
ROLLED SHAPES FOR AGRICULTURAL MACHINES

ГОСТ 3294-53

Steel I-Beams, Low

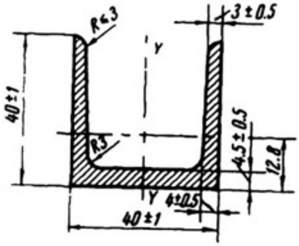
Shape No.	h		b		s		t		Area of section, cm²	Theoretical weight per linear metre, kg	Moment of inertia		Grade of steel
	nominal	permissible deviation	nominal	permissible deviation	nominal	permissible deviation	nominal	permissible deviation			I_X	I_Y	
	mm										cm⁴		
1	45	±1	32	±1	8	+0.4 −0.8	9	+0.4 −0.5	7.91	6.21	20.3	4.9	MCт. 5
2	70		46		15		9		16.70	13.20	109.4	17.6	MCт. 6
3	70		50		6.5		9		11.49	9 02	85 5	15.2	MCт. 5

Steel I-Beams, Heavy

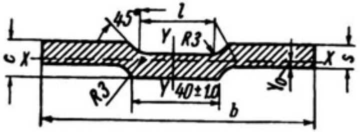

Y
R 10.5
R2
R2
R162
X
X
R5.5
29±0.7
40±1
70±1.5
$21^{+0.5}_{-0.7}$
$32^{+0.5}_{-0.7}$
53±1
Y

Area of section, cm²	Theoretical weight per linear metre, kg	Moment of inertia		Grade of steel
		I_X	I_Y	
		cm⁴		
23.7	18 92	126.05	34.47	МСт. 6

Thin-Walled Box Beams

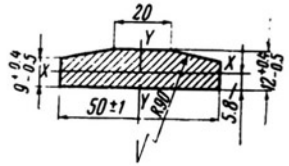

R≤3
3±0.5
Y
40±1
R3
4.5±0.5
12.8
Y
4±0.5
40±1

Area of section, cm²	Theoretical weight per linear metre, kg	Moment of inertia		Grade of steel
		I_X	I_Y	
		cm⁴		
4 32	3.39	6.16	10.49	Ст. 3



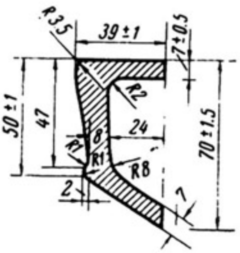
Single Grooved Steel

Shape No.	b		s		c		l		Area of section, cm²	Theoretical weight per linear metre, kg	Y_0, mm	Moment of inertia		Grade of steel
	nominal	permissible deviation	nominal	permissible deviation	nominal	permissible deviation	nominal	permissible deviation				I_X	I_Y	
	mm											cm⁴		
1	80	+1.2 −1.5	6	+0.4 −0.5	12	+0.4 −0.5	31	±1	5.34	4.19	5.8	0.523	28.58	Ст. 3
2	100		8		13		31		8.45	6.63	6.95	0.96	68.5	Ст. 3
3	120	+2.0 −2.5	10	+0.5 −0.7	15	+0.5 −0.7	35		12.25	9.61	8.0	1.69	144.9	Ст. 3
4	140		10		15		35		14.25	11.19	8.5	1.93	229.8	Ст. 3


20
Y
X
9+0.4 -0.5
50±1
Y
R90
5.8
12+0.4 -0.5
X

Beater-Plate Flat Steel

Section area, cm²	Theoretical weight per linear metre, kg	Moment of inertia		Grade of steel
		I_X	I_Y	
		cm⁴		
5.83	4.58	0.67	11.79	Ст 3


R3.5
39±1
7±0.5
R2
50±1
47
24
70±1.5
8
R1
R1
R8
2
7

Beater-Base Steel

Section area, cm²	Theoretical weight per linear metre, kg	Grade of steel
9.71	7.63	Ст. 5

Sections are supplied in the following lengths:

unmeasured . . . . . from 4 to 9 m

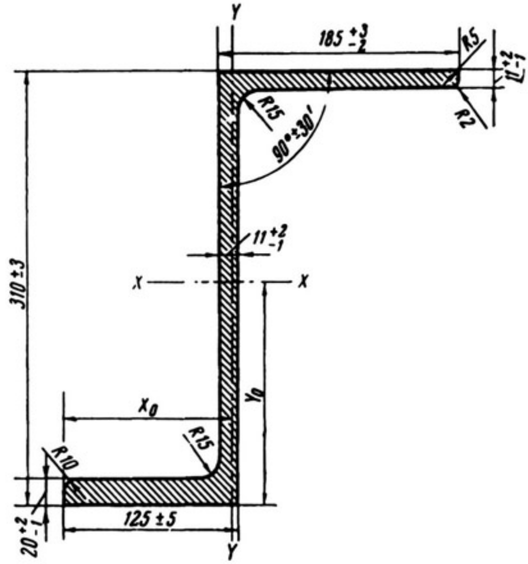
measured lengths and multiples of these lengths as specified in order

The local curvature of sections in the plane and along the edge hall not exceed 6 mm per linear metre.

SECTIONS FOR LOCOMOTIVES AND GOODS WAGONS

ГОСТ 5267-50

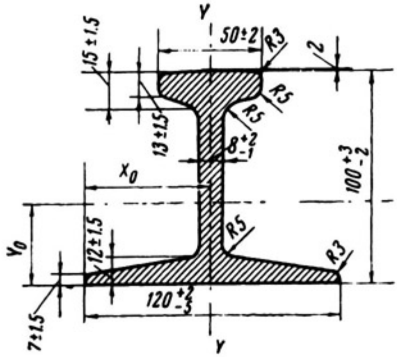
Steel Zees for Centre Sills


Y
185 $^{+3}_{-2}$
R5
11 $^{+2}_{-1}$
R15
90°±30'
R2
11 $^{+2}_{-1}$
X
X
310±3
X_0
Y_0
R15
R10
20 $^{+2}_{-1}$
125±5
Y

Reference data

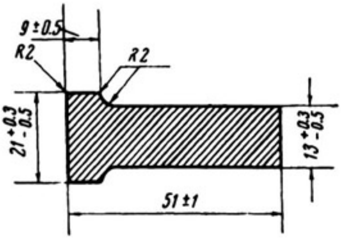
Section area, cm^2	Theoretical weight per linear metre, kg	Moment of inertia		Moment of resistance				X_0	Y_0
				W_X		W_Y			
		I_X	I_Y	top	bottom	right	left		
		cm^4		cm^3				cm	
76.94	60 4	11.903	3184.2	742.0	796.0	257.4	181.6	12.37	14.96

Wagon Posts

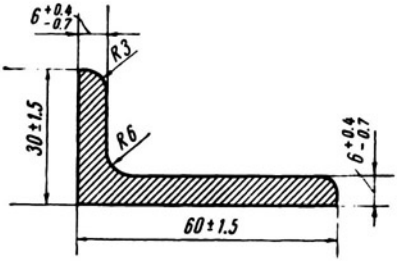

Y
50±2
R3
2
15±1.5
R5
R5
13±1.5
8^{+2}_{-1}
100^{+3}_{-2}
X_0
Y_0
12±1.5
R5
R3
120^{+2}_{-3}
7±1.5
Y

Reference data

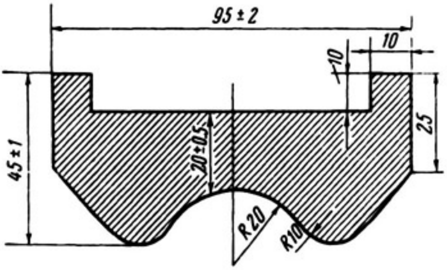
Section area, cm^2	Theoretical weight per linear metre, kg	I_X	I_Y	W_X		W_Y cm^4	X_0	Y_0
				top	bottom			
		cm^4		cm^3			cm	
24.54	19.26	371.25	132.67	62.5	91.44	22.11	6.0	4.06


9±0.5
R2
R2
$21^{+0.3}_{-0.5}$
$13^{+0.3}_{-0.5}$
51±1

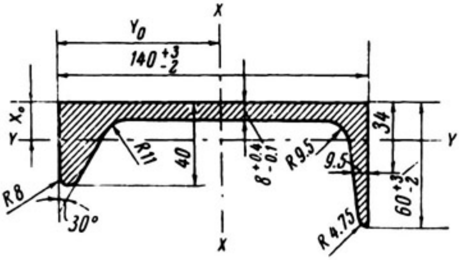
Wagon Door Rail


6 +0.4 -0.7
R3
30±1.5
R6
6 +0.4 -0.7
60±1.5

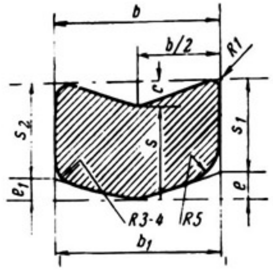
Frame Securing Angle


95±2
10
10
45±1
20±0.5
25
R20
R10

Steel for Spring-Hanger Support


X
Y0
140 +3 -2
X0
Y
R11
40
8 +0.4 -0.1
R9.5
9.5
34
Y
60 +3 -2
R8
30°
R4.75
X

Bulb Angles for Wagons



Steel for Tyres

Dimensions and permissible deviation, mm							
b	b_1	s	c	s_1	s_2	e	e_1
18—1.0	16.5—1.0	10	3	10—0.6	11—0.6	3	2
18—1.0	16.5—1.0	11	3	11—0.6	12—0.6	3	2

SLABS

ГОСТ 9137-59

Hot-Rolled Slabs for Sheets and Strip

Thickness	Permissible deviation	Thickness	Permissible deviation
mm		mm	
100	±4	150	±5
105		160	
110		170	
115		180	
120		190	
125		200	
130		210	
135		220	
140		230	
145		240	
		250	

Slabs are available in the following widths:

from 300 to 700 mm with gradations of 20 mm and from 700 to 2,000 mm with gradations of 50 mm.

Slabs of other widths within the limits indicated above can be supplied on mutual agreement.

Permissible deviation in width of slabs ±10 mm.

Slabs are supplied in lengths specified in the order but within the range of 1,300—5,000 mm.

Slabs less than 1,300 mm long are supplied in multiples of lengths, with or without transverse notches, according to agreement. The unsawed part of the slab should not exceed 0.1 of its width.

Slabs in lengths from 900 to 1,300 mm can be supplied on mutual agreement.

Permissible deviation in length of slabs $^{+50}_{-30}$ mm

Permissible deviation in weight $^{+4}_{-3}$ % of nominal.

HOT-ROLLED AND FORGED TOOL STEEL, ROUND AND SQUARE

ГОСТ 1133-41

Dimensions of Bars

Diameter of circle or side of square, mm	Permissible deviation in diameter and side of square		Round		Square	
	hot-rolled	forged	area of cross-section, mm²	theoretical weight per linear metre, kg	area of cross-section, mm²	theoretical weight per linear metre, kg
6	+0.5	—	28.27	0.222	—	—
7	+0.5	—	38.48	0.302	—	—
8	+0.5	—	50.27	0.395	64	0.50
9	+0.5	—	63.62	0.499	81	0.64
10	+0.5	—	78.54	0.617	100	0.78
11	+0.6	—	95.03	0.746	121	0.95
12	+0.6	—	113.10	0.888	144	1.13
13	+0.6	—	132.73	1.131	169	1.32

Continued

Diameter of circle or side of square, mm	Permissible deviation in diameter and side of square		Round		Square	
	hot-rolled	forged	area of cross-section, mm²	theoretical weight per linear metre, kg	area of cross-section, mm²	theoretical weight per linear metre, kg
14	+0.6	—	153.90	1.210	196	1.54
15	+0.7	—	176.70	1.390	225	1.77
16	+0.7	—	201.10	1.580	256	2.01
17	+0.7	—	226.98	1.781	289	2.35
18	+0.7	—	254.50	2.009	324	2.54
19	+0.7	—	283.53	2.226	361	2.83
20	+0.7	—	314.20	2.467	400	3.14
21	+0.8	—	346.36	2.685	—	—
22	+0.8	—	380.18	2.984	484	3.80
23	+0.8	—	415.52	3.262	—	—
24	+0.8	—	452.44	3.552	—	—
25	+0.9	—	490.90	3.853	625	4.91
26	+0.9	—	530.99	4.168	—	—
27	+0.9	—	572.63	4.498	—	—
28	+0.9	—	615.83	4.834	—	—
29	+0.9	—	660.60	5.186	—	—
30	+0.9	—	706.95	5.550	900	7.06
31	+1.0	—	754.87	5.921	—	—
32	+1.1	—	804.35	6.314	1 024	8.04
33	+1.2	—	855.41	6.714	—	—
34	+1.2	—	907.92	7.127	—	—
35	+1.2	—	962.10	7.550	1 225	9.62
38	+1.2	—	1 134.00	8.903	—	—
40	+1.3	+2.0	1 256.30	9.865	1 600	12.57
42	+1.3	+2.0	1 385.44	10.875	—	—
45	+1.3	+2.0	1 590.43	12.485	2 025	15.90
48	+1.3	+2.0	1 809.56	14.205	—	—
50	+1.4	+2.0	1 963.49	15.413	2 500	19.63
52	+1.6	+2.5	2 123.37	16.7	—	—
55	+1.6	+2.5	2 375.82	18.7	3 225	23.76
60	+1.6	+2.5	2 827.43	22.2	3 600	28.27

Continued

Diameter of circle or side of square, mm	Permissible deviation in diameter and side of square		Round		Square	
	hot-rolled	forged	area of cross-section, mm²	theoretical weight per linear metre, kg	area of cross-section, mm²	theoretical weight per linear metre, kg
65	+1.6	+2.5	3 318.00	26.0	4 225	33.18
70	+1.6	+2.5	3 848.44	30.2	4 900	38.48
75	+1.8	+3.0	4 417.86	34.7	5 625	44.18
80	+2.0	+3.0	5 026.54	39.5	6 400	50.27
85	+2.0	+3.0	5 674.50	44.5	—	—
90	+2.0	+3.5	6 361.72	49.9	8 100	63.62
95	+2.2	+3.5	7 088.21	55.6	—	—
100	+2.5	+3.5	7 853.80	61.7	10 000	78.53
105	+2.6	+3.5	8 659.00	68.0	—	—
110	+2.6	+4.0	9 503.00	74.6	12 100	95.03
115	+2.6	+4.0	10 387.00	81.5	—	—
120	+3.2	+4.5	11 310.00	88.8	14 400	113.10
125	+3.2	+4.5	12 272.00	96.3	—	—
130	+3.2	+4.5	13 273.00	104.2	16 900	132.73
135	+3.2	+4.5	14 314.00	112.4	—	—
140	+3.5	+4.5	15 394.00	120.8	19 600	153.94
145	+3.5	+4.5	16 504.00	129.5	—	—
150	+3.5	+5.0	17 672.00	138.7	22 500	176.72
155	+4.0	+6.0	18 869.92	147.9	—	—
160	+4.0	+6.0	20 106.00	157.8	25 600	201.06
165	+4.0	+6.0	21 382.44	167.9	—	—
170	+5.0	+7.0	22 698.00	178.10	28 900	226.98
175	+5.0	+7.0	42 052.80	188.8	—	—
180	+5.0	+7.0	25 450.00	200.6	32 400	254.50

Curvature of bars shall not exceed 6 mm per linear metre.

Ovalness (difference between the greatest and least diameter of a section) shall not exceed 0.75 of permissible deviation.

Minimum length of bars:

forged	0.75; 1.5 m
rolled	1.0; 2.5 m

HOT-ROLLED AND FORGED HIGH-SPEED TOOL STEEL, ROUND AND SQUARE

ГОСТ 5650-51

Dimensions of Bars

Diameter of circle or side of square	Permissible deviation in diameter of circle or side of square	
	hot-rolled	forged
mm		
8	+0.5	—
9	+0.5	—
10	+0.5	—
11	+0.6	—
12	+0.6	—
13	+0.6	—
14	+0.6	—
15	+0.7	—
16	+0.7	—
17	+0.7	—
18	+0.7	—
19	+0.7	—
20	+0.7	—
21	+0.8	—
22	+0.8	—
23	+0.8	—
24	+0.8	—
25	+0.9	—
26	+0.9	—
27	+0.9	—
28	+0.9	—
29	+0.9	—
30	+0.9	—
31	+1.0	—
32	+1.1	—
33	+1.2	—
34	+1.2	—
35	+1.2	—

Continued

Diameter of circle or side of square	Permissible deviation in diameter of circle or side of square	
	hot-rolled	forged
	mm	
36	+1.2	—
37	+1.2	—
38	+1.2	—
39	+1.2	—
40	+1.3	+2.0
42	+1.3	+2.0
45	+1.3	+2.0
48	+1.3	+2.0
50	+1.4	+2.0
52	+1.6	+2.5
55	+1.6	+2.5
58	—	+2.5
60	+1.6	+2.5
63	—	+2.5
65	+1.6	+2.5
68	—	+2.5
70	+1.6	+2.5
73	—	+2.5
75	+1.8	+3.0
78	—	+3.0
80	—	+3.0
83	—	+3.0
85	+2.0	+3.0
90	+2.0	+3.5
95	+2.2	+3.5
100	+2.5	+3.5

Curvature (local) of bars shall not exceed 5 mm per linear metre.

Ovalness (difference between the greatest and the least diameter of a section) shall not exceed 0.6 of the permissible deviation.

Minimum length of rods:

rolled . . . . 1.0; 2.5 m
forged . . . . 0.75; 1.5 m

POLISHED BLACK SHEETS

ГОСТ 1127-57

Available in sheets of 512×712 mm

Gauge No	Thickness	
	minimum	maximum
	mm	
25	0.22	0.27
28	0.25	0.31
32	0.28	0.34
36	0.31	0.39
40	0.36	0.44
45	0.41	0.49
50	0.45	0.55

Black sheets are made from grade 14 кп steel ГОСТ 5343-54.

TIN PLATE

ГОСТ 5343-54

Dimensions—512×712 mm

On mutual agreement, tin plate can be supplied in sheets of the following dimensions, mm:

356×512
492×512
492×560
492×620
492×650

492×712
512×484
512×685
356×712

Gauge No.	Thickness	
	minimum	maximum
	mm	
25	0.22	0.27
28	0.25	0.31
32	0.28	0.34
36	0.31	0.39
40	0.36	0.44
45	0.41	0.49
50	0.45	0.55

Tin plate is made from grade 14кп steel.

HOT-DIPPED TIN PLATE, COILS

ГОСТ 7530-55

Tin plate in coils is made in two grades: ЖК—tin plate for canning industry, and ЖР—tin plate for miscellaneous uses.

Dimensions

Width	Permissible deviation	Width	Permissible deviation
mm			
120	−0.50	239	−0.25
129		252	
137		321	
158		332	−0.50
175	−0.25	375	
180	−0.50	428	±0.50
194		512	
220			

Gauge No.	Thickness		Maximum difference in thickness at different spots in a coil	
	Grade ЖК	Grade ЖР		
	mm		Grade ЖК	Grade ЖР
12	0.11—0.13	0.09—0.14	0.02	0.03
14	0.13—0.15	0.11—0.17	0.02	0.03
16	0.15—0.17	0.13—0.18	0.02	0.03
18	0.17—0.19	0.15—0.20	0.02	0.03
20	0.19—0.21	0.17—0.22	0.02	0.03
22	0.21—0.23	0.19—0.25	0.02	0.03
25	0.24—0.26	0.22—0.27	0.02	0.03
28	0.27—0.29	0.26—0.31	0.02	0.03
32	0.30—0.33	0.30—0.35	0.02	0.04
36	0.34—0.37	0.33—0.38	0.03	0.04

Tin plate in coils is made of steel grade 08 кп according to ГОСТ 1050-52.

SHEET STEEL (ASSORTMENT)

ГОСТ 3680-57

Thickness, mm	Width, mm									
	600	(670)	710	750	800	(900)	1000	(1100)	1250	1400
	Length, mm									
COLD-ROLLED SHEETS										
0.2; 0.25; 0.3; 0.4	1200	1200	1420	1500	1500					
0.5; (0.55); 0.60	1200 2000	1200 2000	1420	1500	1500	1500	1500			
0.7; (0.75)	1200 2000	1200 2000	1420	1500	1500					

Continued

Thickness, mm	Width, mm									
	600	(670)	710	750	800	(900)	1000	(1100)	1250	1400
	Length, mm									
0.8; 0.9	1200 2000	1200 2000	1420 2000	1500 2000	1500 2000	1800 2000	2000	2000 2200	2000 2500	
1.0; 1.1; 1.2; 1.4; (1.5); 1.6; 1.8; 2.0	1420 2000	1420 2000	1420 2000	1500 2000	1500 2000	1800 2000	2000	2000 2200	2000 2500	2800 3000 3500
2.2; 2.5; 2.8; 3.0; 3.2; 3.5; (3.8); 4.0	1420 2000	1420 2000	1420	1500	1500					
HOT-ROLLED SHEETS										
0.5; (0.55); 0.6 0.7; (0.75)	1200 1420	1200 1420	1420							
0.8; 0.9	1200 1420	1200 1420	1420	1500	1500					
1.0; 1.1; 1.2; 1.4; (1.5); 1.6; 1.8	1200 1420	1200 1420	1420	1500	1500	1800 2000	2000			
2.0; 2.2; 2.5; 2.8	1420 2000	1420 2000	1420 2000	1500 2000	1500 2000	1800 2000	2000	2200	2500	
3.0; 3.2; 3.5; (3.8); 4.0	1420 2000	1420 2000	1420 2000	1500 2000	1500 2000	1800 2000	2000	2200	2500	2800 3000 3500 4000

Permissible Deviation in Thickness

Thickness, mm	Permissible deviation, mm			
	A (extra high tolerance)	B (high tolerance)	C (ordinary tolerance)	
	cold-rolled quality sheets	ordinary quality and quality sheets		
		cold- and hot-rolled	hot-rolled	
	all widths		width under 1000	width over 1000
0.2—0.4	±0.03	—	—	—
0.50	±0.04	±0.05	±0.07	±0.07
0.55—0.60	±0.05	±0.06	±0.08	±0.08
0.70—0.75	±0.06	±0.07	±0.09	±0.09
0.80—0.90	±0.06	±0.08	±0.10	±0.10
1.0—1.1	±0.07	±0.09	±0.12	±0.12
1.2	±0.09	±0.11	±0.13	±0.13
1.4	±0.10	±0.12	±0.15	±0.15
1.5	±0.11	±0.12	±0.15	±0.15
1.6—1.8	±0.12	±0.14	±0.16	±0.16
2.0	±0.13	±0.15	+0.15 —0.18	±0.18
2.2	±0.14	±0.16	+0.15 —0.19	±0.19
2.5	±0.15	±0.17	+0.16 —0.20	±0.20
2.8—3.0	±0.16	±0.18	+0.17 —0.22	±0.22
3.2—3.5	±0.18	±0.20	+0.18 —0.25	±0.25
3.8—4.0	±0.20	±0.22	+0.20 —0.30	±0.30

STEEL PLATE (ASSORTMENT)

ГОСТ 5681-57

Thickness	Width	Length
	mm	
4; 4.5	600, 710, 1000, 1250, 1400, 1500, 1600	2000, 2500, 2800, 3500, (4200), 4500, 5000, 5500, 6000
5; 5.5	1250, 1400, 1500, 1600	2500, 2800, 3000, 3500, (4200), 4500, 5000, 5500, 6000
6; 7	1250, 1400, 1500, 1600, (1700), 1800	2800, 3500, (4200), 4500, 5000, 5500, 6000, (6500), 7000
8	1250, 1400, 1500, 1600, (1700), 1800, (1900), 2000	2800, 3500, (4200), 4500, 5000, 5500, 6000, (6500), 7000
9; 10; 11	1250, 1400, 1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200	2800, 3500, (4200), 4500, 5000, 5500, 6000, (6500), 7000
12; (13); 14; (15)	1400, 1500, 1600, (1700), 1800, (1900), 2000, 2200, 2300	(4200), 4500, 5000, 5500, 6000, (6500), 7000, (7500), 8000
16, (17), 18, (19), 20	1400, 1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200, 2300	4500, 5000, 5500, 6000, (6500), 7000, (7500), 8000
(21), 22, (24), 25, (26), 28, 30, 32	1400, 1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200, (2300), 2400	4500, 5000, 5500, 6000, (6500), 7000, (7500), 8000
(34), 36, (38), 40, (42), 45, (48), 50, (53), 56, 60	1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200, (2300), (2400), 2500	4500, 5000, 5500, 6000, (6500), 7000, (7500), 8000

Continued

Thickness	Width	Length
mm		
63, (65), 70, (75), 80, (85), 90, (95), 100	1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200, 2300, (2400), 2500, (2600), (2700), 2800, (2900), 3000	4000, 4500, 5000, 5500, 6000, (6500), 7000
(105), 110, (120), 125, (130)	1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200, (2300), (2400), 2500, (2600), (2700), 2800, (2900), 3000	4000, 4500, 5000, 5500, 6000
140, (150), 160	1500, 1600, (1700), 1800, (1900), 2000, (2100), 2200, (2300), (2400), 2500, (2600), (2700), 2800, (2900), 3000	3500, 4000, 4500, 5000

Note to the Table:

The curvature of the strips shall not exceed:

1 mm per linear metre (Class A)
2 mm per linear metre (Class B)

Strips are supplied in lengths of 5—18 m.
Rounding of the edges of a radius up to 2 mm, is permissible.

SHEET STEEL FOR ELECTRICAL ENGINEERING INDUSTRY

ГОСТ 802-58

Dimensions of Sheets

Grade	Thickness	Width	Length
	mm		
Э11, Э12	1.0	750	1500
	1.0	860	1720
	1.0	1000	2000
Э11, Э12, Э13, Э21, Э22	0.50	600	1200
	0.50	670	1340
	0.50	750	1500
	0.50	860	1720
	0.50	1000	2000
Э31, Э32, Э41, Э42, Э43, Э43А	0.50	600	1500
	0.50	750	1500
	0.50	860	1720
	0.50	1000	2000
	0.35	750	1500
	0.35	1000	2000
Э44	0.35	750	1500
	0.20	700	720
	0.20	700	1400
	0.10	700	720
Э45, Э46, Э47, Э48	0.35	750	1500
	0.20	700	720
	0.20	700	1400

Continued

Grade	Thickness	Width	Length
	mm		
Э1100, Э1200, Э1300, Э3100, Э3200	0.50	600	1500
	0.50	670	1340
	0.50	750	1500
	0.50	860	1720
	0.50	1000	2000
Э310, Э320, Э330	0.50	600	1500
	0.50	750	1500
	0.50	860	1720
	0.50	1000	2000
Э310, Э320, Э330, Э330А	0.35	240	1500
	0.35	750	1500
	0.35	1000	2000
Э340	0.20	240	1500
	0.20	750	1500
Э370, Э380	0.50	600	1500
	0.50	750	1500
	0.35	240	1500
	0.35	750	1500
	0.20	240	1500
	0.20	750	1500

STEEL ROOFING SHEETS, PICKLED AND GALVANIZED

ГОСТ 8075-56

Thickness	Permissible deviation	Width and length, mm										
		510×710	510×1420	(670×1420)	710×1420	(750×1500)	600×2000	710×2000	750×2000	1000×2000	1250×2500	1500×2500
mm		Weight of 1 sheet, kg (theoretical)										
0.25	±0.04	0.7	—	—	—	—	—	—	—	—	—	—
0.28		0.8	—	—	—	—	—	—	—	—	—	—
0.32		0.9	—	—	2.5	—	—	—	—	—	—	—
0.35		1.0	—	—	2.8	—	—	—	—	—	—	—
0.40		1.1	2.3	3.0	3.2	3.5	3.8	4.5	4.7	—	—	—
0.45		1.3	2.6	3.3	3.5	4.0	4.2	5.0	5.3	—	—	—
0.50		1.4	2.8	3.7	4.0	4.4	4.7	5.6	5.9	—	—	—

0.55	±0.05	1.6	3.1	4.0	4.4	4.9	5.2	6.1	6.5	—	—	—
0.63		1.8	3.6	4.7	5.0	5.6	5.9	7.0	7.4	—	—	—
0.70	±0.06	2.0	4.0	5.2	5.5	6.2	6.6	7.8	8.2	11.0	17.2	—
0.80		2.3	4.5	6.0	6.3	7.1	7.5	8.9	9.9	12.6	19.6	—
0.90		—	—	—	7.1	8.0	8.5	10.0	10.6	14.1	22.1	—
1.0	±0.07	—	—	—	7.9	8.8	9.4	11.2	11.8	15.7	24.5	—
1.12		—	—	—	8.9	9.8	10.6	12.5	13.2	17.4	27.5	—
1.25	±0.09	—	—	—	9.9	11.0	11.8	13.9	14.7	19.6	30.7	—
1.40	±0.11	—	—	—	11.1	12.4	13.2	15.6	16.5	22.0	34.3	—
1.60		—	—	—	12.7	14.1	15.1	17.8	18.8	25.1	39.2	47.1
1.80	±0.12	—	—	—	14.3	15.9	17.0	20.1	21.2	28.3	44.1	53.0
2 0	±0.13	—	—	—	15.8	17.7	18.8	22.3	23.6	31.4	49.1	58.9

HOT-ROLLED STEEL STRIP

ГОСТ 6009-57

Dimensions

Width, mm	1.2	1.4	(1.5)	1.6	(1.7)	1.8	2.0	2.2	2.5	2.8	3.0	3.2	3.5	3.8
Thickness, mm	Theoretical weight per linear metre, kg													
20	0.188	0.220	0.236	0.251	0.267	0.283	0.314	0.345	0.393	0.440	0.471	0.502	0.550	0.597
22	0.207	0.241	0.259	0.276	0.294	0.311	0.345	0.380	0.432	0.484	0.518	0.553	0.604	0.656
25	0.235	0.275	0.294	0.314	0.334	0.353	0.393	0.432	0.491	0.550	0.589	0.628	0.687	0.746
28	0.264	0.308	0.330	0.352	0.374	0.396	0.440	0.484	0.550	0.615	0.659	0.703	0.769	0.835
30	0.282	0.330	0.353	0.377	0.400	0.424	0.471	0.518	0.589	0.659	0.707	0.754	0.824	0.895
32	0.301	0.351	0.377	0.402	0.427	0.452	0.502	0.552	0.628	0.703	0.753	0.804	0.879	0.954
36	0.339	0.395	0.424	0.452	0.480	0.509	0.565	0.622	0.706	0.791	0.848	0.904	0.989	1.074
40	0.377	0.439	0.471	0.502	0.534	0.565	0.628	0.691	0.785	0.879	0.942	1.005	1.099	1.193
45	0.424	0.494	0.530	0.565	0.601	0.636	0.707	0.777	0.883	0.989	1.060	1.131	1.237	1.343
50	0.471	0.549	0.589	0.628	0.667	0.707	0.785	0.864	0.981	1.099	1.178	1.256	1.374	1.492
56	—	—	—	—	—	—	—	—	1.099	1.231	1.319	1.401	1.538	1.670
60	—	—	—	—	—	—	—	—	1.178	1.319	1.413	1.507	1.649	1.790
63	—	—	—	—	—	—	—	—	1.236	1.385	1.483	1.581	1.731	1.879

65	—	—	—	—	—	—	—	—	1.276	1.429	1.531	1.633	1.786	1.939
70	—	—	—	—	—	—	—	—	1.374	1.539	1.649	1.758	1.923	2.088
75	—	—	—	—	—	—	—	—	1.472	1.649	1.766	1.884	2.061	2.237
80	—	—	—	—	—	—	—	—	1.570	1.758	1.884	2.010	2.198	2.386
85	—	—	—	—	—	—	—	—	1.668	1.868	2.002	2.135	2.336	2.536
90	—	—	—	—	—	—	—	—	1.766	1.978	2.120	2.261	2.473	2.685
95	—	—	—	—	—	—	—	—	1.865	2.088	2.237	2.387	2.610	2.834
100	—	—	—	—	—	—	—	—	1.963	2.198	2.355	2.512	2.748	2.983
105	—	—	—	—	—	—	—	—	2.061	2.308	2.473	2.638	2.885	3.132
110	—	—	—	—	—	—	—	—	2.160	2.418	2.590	2.763	3.020	3.281
120	—	—	—	—	—	—	—	—	2.355	2.638	2.826	3.014	3.297	3.580
125	—	—	—	—	—	—	—	—	2.452	2.748	2.944	3.140	3.435	3.729
130	—	—	—	—	—	—	—	—	2.551	2.857	3.062	3.266	3.570	3.878
140	—	—	—	—	—	—	—	—	2.748	3.077	3.297	3.517	3.847	4.176
150	—	—	—	—	—	—	—	—	2.944	3.297	3.533	3.758	4.120	4.475
160	—	—	—	—	—	—	—	—	—	—	3.768	4.019	4.396	4.773
170	—	—	—	—	—	—	—	—	—	—	4.004	4.270	4.670	5.071
180	—	—	—	—	—	—	—	—	—	—	4.239	4.522	4.946	5.369
190	—	—	—	—	—	—	—	—	—	—	4.475	4.773	5.220	5.668
200	—	—	—	—	—	—	—	—	—	—	4.710	5.024	5.495	5.966

BROAD STEEL STRIPS, UNIVERSAL

ГОСТ 82-57

Width, mm	Thickness, mm							
	4	5	6	7	8	9	10	11
	Weight per linear metre, kg							
160	5.02	6.28	7.54	8.79	10.05	11.30	12.56	13.82
170	5.34	6.67	8.01	9.34	10.68	12.01	13.35	14.68
180	5.65	7.07	8.48	9.89	11.30	12.72	14.13	15.54
190	5.97	7.46	8.95	10.44	11.93	13.42	14.92	16.41
200	6.28	7.85	9.42	10.99	12.56	14.13	15.70	17.27
210	6.59	8.24	9.89	11.54	13.19	14.84	16.49	18.13
220	6.91	8.64	10.36	12.09	13.82	15.54	17.27	19.00
240	7.54	9.42	11.30	13.19	15.07	16.96	18.84	20.72
250	7.85	9.81	11.78	13.74	15.70	17.66	19.63	21.59
260	8.16	10.21	12.25	14.29	16.33	18.37	20.41	22.45
280	8.79	10.99	13.19	15.39	17.58	19.78	21.98	24.18
300	9.42	11.78	14.13	16.49	18.84	21.20	23.55	25.91
320	—	12.56	15.07	17.58	20.10	22.61	25.12	27.63
340	—	13.35	16.01	18.68	21.35	24.02	26.69	29.36
360	—	—	16.96	19.78	22.61	25.43	28.26	31.09
380	—	—	17.90	20.88	23.86	26.85	29.83	32.81
400	—	—	18.84	21.98	25.12	28.26	31.40	34.54
420	—	—	19.78	23.08	26.38	29.67	32.97	36.27
450	—	—	21.20	24.73	28.26	31.79	35.33	38.86
480	—	—	22.61	26.37	30.14	33.91	37.68	41.44
500	—	—	23.55	27.48	31.40	35.33	39.25	43.18
530	—	—	24.96	29.12	33.28	37.44	41.61	45.77
560	—	—	26.37	30.77	35.17	39.56	43.96	48.35
600	—	—	28.26	32.97	37.68	42.39	47.10	51.81
630	—	—	29.67	34.62	39.56	44.51	49.46	54.40
650	—	—	30.62	35.72	40.82	45.92	51.03	56.13
670	—	—	31.53	36.80	42.15	47.30	52.59	57.80
710	—	—	33.45	39.00	44.67	50.56	55.73	61.30
750	—	—	35.33	41.21	47.10	52.99	58.88	64.76
800	—	—	37.68	43.96	50.24	56.52	62.80	69.08
850	—	—	40.04	46.71	53.38	60.05	66.73	73.40
900	—	—	42.39	49.46	56.52	63.59	70.65	77.72
950	—	—	44.75	52.20	59.66	67.12	74.58	82.03
1000	—	—	47.10	54.95	62.80	70.65	78.50	86.35
1050	—	—	49.46	57.70	65.94	74.18	82.43	90.67

Continued

Width, mm	Thickness, mm							
	12	14	16	18	20	22	25	28
	Weight per linear metre, kg							
160	15.07	17.58	20.10	22.61	25.12	27.63	31.40	35.17
170	16.01	18.68	21.35	24.02	26.69	29.36	33.36	37.37
180	16.96	19.78	22.61	25.43	28.26	31.09	35.33	39.56
190	17.90	20.88	23.86	26.85	29.83	32.81	37.29	41.76
200	18.84	21.98	25.12	28.26	31.40	34.54	39.25	43.96
210	19.78	23.08	26.38	29.67	32.97	36.27	41.21	46.16
220	20.72	24.18	27.63	31.09	34.54	37.99	43.18	48.36
240	22.61	26.38	30.14	33.91	37.68	41.45	47.10	52.75
250	23.55	27.48	31.40	35.33	39.25	43.18	49.06	54.95
260	24.49	28.57	32.66	36.74	40.82	44.90	51.03	57.15
280	26.38	30.77	35.17	39.56	43.96	48.36	54.95	61.54
300	28.26	32.97	37.68	42.39	47.10	51.81	58.88	65.94
320	30.14	35.17	40.19	45.22	50.24	55.26	62.80	70.34
340	32.03	37.37	42.70	48.04	53.38	58.72	66.73	74.73
360	33.91	39.56	45.22	50.87	56.52	62.17	70.65	79.13
380	35.80	41.76	47.73	53.69	59.66	65.63	74.58	83.52
400	37.68	43.96	50.24	56.52	62.80	69.08	78.50	87.92
420	39.56	46.16	52.75	59.35	65.94	72.53	82.43	92.32
450	42.39	49.46	56.52	63.59	70.65	77.72	88.31	98.91
480	45.21	52.75	60.29	67.82	75.36	82.89	94.20	105.50
500	47.10	54.95	62.80	70.65	78.50	86.35	98.13	109.90
530	49.93	58.25	66.57	74.89	83.21	91.53	104.01	116.49
560	52.75	61.54	70.33	79.12	87.92	96.71	109.90	123.08
600	56.52	65.94	75.36	84.78	94.20	103.62	117.75	131.88
630	59.35	69.24	79.13	89.02	98.91	108.80	123.64	138.47
650	61.23	71.44	81.64	91.85	102.05	112.26	127.56	142.87
670	63.10	73.60	84.10	94.60	105.18	115.60	131.50	147.40
710	66.80	78.00	89.20	100.40	111.46	122.50	139.40	156.00
750	70.65	82.43	94.20	105.98	117.75	129.53	147.19	164.85
800	75.36	87.92	100.48	113.04	125.60	138.16	157.00	175.84
850	80.07	93.42	106.76	120.11	133.45	146.80	166.81	186.83
900	84.78	98.91	113.04	127.17	141.30	155.43	176.63	197.82
950	89.49	104.41	119.32	134.24	149.15	164.07	186.44	208.81
1000	94.20	109.90	125.60	141.30	157.00	172.70	196.25	219.80
1050	98.91	115.40	131.88	148.37	164.85	181.34	206.06	230.79

Continued

Width, mm	Thickness, mm							
	30	32	36	40	45	50	56	60
	Weight per linear metre, kg							
160	37.68	40.19	45.22	50.24	56.52	62.80	70.33	75.36
170	40.04	42.70	48.04	53.38	60.05	66.73	74.73	80.07
180	42.39	45.22	50.87	56.52	63.59	70.65	79.12	84.78
190	44.75	47.73	53.69	59.66	67.12	74.58	83.52	89.49
200	47.10	50.24	56.52	62.80	70.65	78.50	87.92	94.20
210	49.46	52.75	59.35	65.94	74.18	82.43	92.31	98.91
220	51.81	55.26	62.17	69.08	77.72	86.35	96.71	103.62
240	56.52	60.29	67.82	75.36	84.78	94.20	105.50	113.04
250	58.88	62.80	70.65	78.50	88.31	98.13	109.90	117.75
260	61.23	65.31	73.48	81.64	91.85	102.05	114.29	122.46
280	65.94	70.34	79.13	87.92	98.91	109.90	123.08	131.88
300	70.65	75.36	84.78	94.20	105.98	117.75	131.88	141.30
320	75.36	80.38	90.43	100.48	113.04	125.60	140.67	150.72
340	80.07	85.41	96.08	106.76	120.11	133.45	149.46	160.14
360	84.78	90.43	101.74	113.04	127.17	141.30	158.25	169.56
380	89.49	95.46	107.39	119.32	134.24	149.15	167.05	178.98
400	94.20	100.48	113.04	125.60	141.30	157.00	175.84	188.40
420	98.91	105.50	118.69	131.88	148.37	164.85	184.71	197.82
450	105.98	113.04	127.17	141.30	158.96	176.63	197.82	211.95
480	113.04	120.55	135.65	150.72	169.56	188.40	211.01	226.18
500	117.75	125.60	141.30	157.00	176.63	196.25	219.80	235.50
530	124.82	133.14	149.78	166.42	187.22	208.03	233.80	249.63
560	131.88	140.67	158.25	175.84	197.82	219.80	246.17	263.76
600	141.30	150.72	169.56	188.40	211.95	235.50	263.76	282.60
630	148.37	158.26	178.04	197.82	222.55	247.28	276.95	296.73
650	153.08	163.28	183.69	204.10	229.61	255.13	285.74	306.15
670	157.78	168.40	189.40	210.36	236.70	263.00	294.70	315.60
710	167.10	178.30	200.70	222.92	250.80	278.50	312.00	334.20
750	176.63	188.40	211.95	235.50	264.94	294.38	329.70	353.25
800	188.40	200.96	226.08	251.20	282.60	314.00	351.68	376.80
850	200.18	213.52	240.21	266.90	300.26	333.63	373.66	400.35
900	211.95	226.08	254.34	282.60	317.93	353.25	395.64	423.90
950	223.73	238.64	268.47	298.30	335.59	372.88	417.62	447.45
1000	235.50	251.20	282.60	314.00	353.25	392.50	439.60	471.00
1050	247.28	263.76	296.73	329.70	370.91	412.13	461.58	494.55

COLD-ROLLED STRUCTURAL STEEL STRIP

ГОСТ 2284-43

Strip of the following types is available:

(a) standard and close tolerance;

(b) bright and black;

(c) trimmed and untrimmed;

(d) work hardened and annealed (low annealing).

Dimensions, mm:

Thickness:	0.10; 0.12; 0.15; 0.18; 0.20; 0.22; 0.25; 0.28; 0.30; 0.35; 0.40; 0.50; 0.55; 0.60; 0.70; 0.75; 0.80; 0.85; 0.90; 0.95; 1.0; 1.05; 1.10; 1.15; 1.20; 1.25; 1.30; 1.35; 1.40; 1.45; 1.50; 1.55; 1.60; 1.65; 1.70; 1.75; 1.80; 1.85; 1.90; 1.95; 2.0; 2.1; 2.2; 2.3; 2.4; 2.5; 2.6; 2.7; 2.8; 2.9; 3.0.
Width:	4; 5; 6; 8; 10; 12; 14; 15; 16; 18; 20; 22; 24; 25; 26; 28; 30; 32; 34; 35; 36; 38; 40; 45; 50; 55; 60; 65; 70; 75; 80; 85; 90; 100.

Strip is made from the following grades of steel:

15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65 and 70 according to ГОСТ 1050-52.

At the time of delivery, strip shall satisfy the following specifications:

Grade	Work hardened		Annealed	
	Tensile strength, kg/mm²	Facultative elongation, %, minimum	Tensile strength, kg/mm²	Elongation, %, minimum
15	45—80	3	32—50	22
20	50—85	2	32—55	20
25	55—90	2	35—60	18
30	65—95	2	40—60	16
35	65—95	2	40—65	16

Grade	Work hardened		Annealed	
	Tensile strength, kg/mm²	Facultative elongation, %, minimum	Tensile strength, kg/mm²	Elongation, %, minimum
40	65—100	2	45—70	15
45	70—105	1.5	45—70	15
50	75—110	1.5	45—75	13
55	75—110	1.5	45—75	12
60	75—115	1	45—75	12
65	75—115	1	45—75	10
70	75—115	1	45—75	10

At the Customer's demand strip, grade 15 to 50, shall after low annealing withstand bending test through 180° against the grain or through 90° with the grain on arbor equal to the thickness of the strip without fissures or seams.

In grades 40—70 the depth of unilateral decarburizing shall not exceed for strip of width, mm:

up to 0.5	0.02 mm
over 0.5 up to 1.0	0.04 mm
over 1.0 up to 2.0	0.06 mm
over 2.0 up to 3.0	0.08 mm

Strip is made of the following grades of steel: У8А, У9А, У10А, У11А, У12А, (ГОСТ 1435-54), 65Г (ГОСТ 1050-52), 60С2А (ГОСТ 2052-53), 70С2ХА (ГОСТ 2283-57), and Х05 (ГОСТ 5950-51).

Mechanical Properties

Strength group	Tensile strength, kg/mm^2	Vickers hardness
1 П	130–160	375–485
2 П	161–190	486–600
3 П	over 190	over 600

Thickness of strip	Radius of jaws of apparatus	Number of alternating bends, minimum		
mm		1 П 130–160	2 П 161–190	3 П over 190
0.08	1	35	22	18
0.10	1	33	19	17
0.11	1	27	19	17
0.12	1	23	18	16
0.14	1	21	11	10
(0.15)	2	37	24	21
0.16	2	33	23	19
0.18	2	29	19	17
0.20	2	25	15	13
0.22	2	23	13	9
0.25	2	21	9	7
0.28	4	43	26	19
(0.30)	4	39	22	18
0.32	4	38	20	17
0.36	4	37	19	16
0.40	4	34	15	12
0.45	4	29	12	9
0.50	6	37	21	18
0.55	6	35	19	14
0.60	6	33	15	11
0.70	6	24	9	5
0.80	8	27	9	4
0.90	8	24	3	—
1.00	8	21	2	—

SPRING STEEL STRIP,

ГОСТ

Dimen

Thickness, mm	Width,																	
	(1.5)	1.6	1.8	2	2.2	2.5	2.8	3	3.6	4	4.5	5	5.5	6	7	8	9	10
0.08	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.10	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.11	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.12	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.14	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
(0.15)	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.16	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.18	—	—	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X
0.20	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.22	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.28	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
(0.30)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.32	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.36	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.40	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.45	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.50	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.55	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.60	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
0.70	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X
0.80	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X
0.90	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X
1.00	—	—	—	—	—	X	X	X	X	X	X	X	X	X	X	X	X	X
1.10	—	—	—	—	—	X	X	X	X	X	X	X	X	X	—	—	—	—
1.20	—	—	—	—	—	X	X	X	X	X	X	X	X	X	—	—	—	—
1.40	—	—	—	—	—	X	X	X	X	X	X	X	X	X	—	—	—	—
1.50	—	—	—	—	—	X	X	X	X	X	X	X	X	X	—	—	—	—

Strip with dimensions shown to the left of the heavy line is not

HEAT-TREATED

2614-55

sions

mm

11	12	14	(15)	16	18	20	22	25	28	30	32	36	40	45	50	55	60	70	80
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

trimmed.

HOT-ROLLED STEEL STRIP, COILS

ГОСТ 8597-57

Dimensions

Width, mm	Thickness, mm													
	1.20	1.40	1.50	1.60	1.80	2.00	2.20	2.50	2.80	3.00	3.20	3.50	3.80	4.00
	Weight per linear metre, kg													
200	1.88	2.20	2.36	2.51	2.83	3.14	3.45	3.93	4.40	4.71	5.02	5.50	5.97	6.28
210	2.00	2.31	2.47	2.64	2.97	3.30	3.63	4.12	4.62	4.94	5.28	5.79	6.26	6.59
220	2.07	2.42	2.59	2.76	3.11	3.45	3.80	4.32	4.84	5.18	5.53	6.04	6.56	6.91
240	2.26	2.64	2.83	3.01	3.39	3.77	4.14	4.71	5.28	5.66	6.03	6.59	7.16	7.54
250	2.36	2.75	2.94	3.14	3.53	3.93	4.32	4.91	5.50	5.89	6.28	6.87	7.46	7.85
260	2.45	2.86	3.06	3.27	3.67	4.08	4.49	5.10	5.71	6.12	6.53	7.14	7.76	8.16
280	2.64	3.07	3.30	3.52	3.96	4.40	4.84	5.50	6.15	6.59	7.03	7.69	8.35	8.79
300	2.83	3.30	3.53	3.77	4.24	4.71	5.18	5.89	6.59	7.06	7.54	8.24	8.95	9.42
320	3.04	3.51	3.77	4.02	4.52	5.02	5.52	6.28	7.06	7.54	8.04	8.79	9.54	10.04
340	3.20	3.73	4.00	4.27	4.80	5.33	5.86	6.66	7.48	8.01	8.56	9.33	10.13	10.66
350	3.30	3.85	4.12	4.40	4.95	5.50	6.05	6.87	7.70	8.24	8.79	9.62	10.45	10.99
360	3.39	3.96	4.24	4.52	5.09	5.65	6.22	7.07	7.91	8.48	9.04	9.89	10.74	11.30
380	3.58	4.18	4.48	4.77	5.37	5.97	6.57	7.46	8.35	8.96	9.54	10.45	11.34	11.94
400	3.77	4.40	4.71	5.02	5.65	6.28	6.91	7.85	8.79	9.42	10.04	10.99	11.93	12.56
420	3.96	4.62	4.95	5.28	5.94	6.59	7.25	8.24	9.23	9.89	10.55	11.54	12.53	13.19
450	4.24	4.94	5.29	5.65	6.36	7.07	7.78	8.83	9.89	10.60	11.30	12.36	13.13	14.13
480	4.52	5.28	5.65	6.03	6.78	7.54	8.29	9.42	10.55	11.30	12.06	13.19	14.32	15.07
500	4.71	5.50	5.89	6.28	7.07	7.85	8.64	9.84	10.99	11.78	12.56	13.74	14.93	15.70
530	4.99	5.83	6.24	6.66	7.49	8.32	9.15	10.40	11.65	12.48	13.32	14.56	15.81	16.64
560	5.28	6.15	6.66	7.03	7.91	8.79	9.67	10.99	12.30	13.19	14.06	15.45	16.70	17.58

Continued

Width, mm	Thickness, mm													
	1.20	1.40	1.50	1.60	1.80	2.00	2.20	2.50	2.80	3.00	3.20	3.50	3.80	4.00
	Weight per linear metre, kg													
600	5.65	6.59	7.07	7.54	8.48	9.42	10.36	11.78	13.18	14.13	15.08	16.49	17.90	18.84
630	5.94	6.92	7.42	7.91	8.90	9.89	10.88	12.36	13.85	14.84	15.83	17.31	18.79	19.78
650	6.12	7.14	7.65	8.17	9.19	10.21	11.23	12.76	14.29	15.30	16.33	17.86	19.40	20.4
670	6.31	7.36	7.89	8.42	9.47	10.52	11.57	13.15	14.73	15.78	16.83	18.41	19.98	21.04
710	6.69	7.80	8.36	8.92	10.03	11.15	12.26	13.97	15.61	16.72	17.84	19.51	21.18	22.29
750	7.07	8.24	8.83	9.42	10.59	11.78	12.96	14.72	16.48	17.66	18.84	20.61	22.37	23.55
800	7.54	8.79	9.42	10.04	11.30	12.56	13.82	15.70	17.58	18.84	20.10	21.98	23.86	25.12
850	8.01	9.34	10.01	10.64	12.01	13.35	14.68	16.68	18.68	20.02	21.36	23.36	25.36	26.69
900	8.48	9.89	10.60	11.30	12.72	14.13	15.54	17.66	19.78	21.20	22.61	24.73	26.85	28.26
950	8.95	10.44	11.19	11.93	13.42	14.92	16.41	18.64	20.88	22.37	23.87	26.11	28.34	29.83
1000	9.42	10.99	11.78	12.56	14.13	15.70	17.27	19.63	21.98	23.55	25.12	27.42	29.83	31.40
1100	—	12.09	12.95	13.82	16.08	17.27	19.00	21.59	24.18	25.91	27.64	30.22	33.30	34.54
1250	—	13.74	14.72	15.70	17.66	19.63	21.59	24.53	27.47	29.44	31.41	34.36	37.29	39.25
1400	—	15.39	16.49	17.58	19.78	21.98	24.18	27.48	30.77	32.97	35.16	38.47	41.76	43.96
1500	—	—	17.66	18.84	21.20	23.55	25.91	29.44	32.97	35.33	37.68	41.21	44.75	47.00
1600	—	—	—	20.10	22.61	25.12	27.64	31.40	35.17	37.65	40.20	44.86	47.73	50.24
1700	—	—	—	—	—	26.69	29.36	33.36	36.94	40.04	42.72	46.72	50.71	53.38
1800	—	—	—	—	—	28.20	31.02	35.33	39.50	42.39	45.22	49.46	53.70	56.52
1900	—	—	—	—	—	29.83	32.82	37.29	41.76	44.75	47.73	52.22	56.66	59.66
2000	—	—	—	—	—	31.40	34.54	39.25	43.96	47.10	50.24	54.95	59.66	62.80
2100	—	—	—	—	—	—	36.27	41.21	46.16	49.46	52.76	57.70	63.73	65.94
2200	—	—	—	—	—	—	—	43.18	48.36	51.81	55.26	60.45	65.63	69.08
2300	—	—	—	—	—	—	—	45.14	50.56	54.17	57.78	63.20	69.70	73.22

Continued

Width, mm	Thickness, mm												
	4.50	5.00	5.60	6.00	6.30	6.70	7.00	7.50	8.00	8.50	9.00	9.50	10.00
	Weight per linear metre, kg												
200	7.07	7.85	8.79	9.42	9.89	10.52	10.99	11.78	12.56	13.35	14.13	14.92	15.70
210	7.42	8.24	9.23	9.89	10.39	10.99	11.54	12.36	13.19	14.01	14.84	15.66	16.49
220	7.77	8.64	9.67	10.36	10.88	11.57	12.09	12.95	13.82	14.68	15.54	16.41	17.27
240	8.48	9.42	10.54	11.30	11.87	12.62	13.19	14.13	15.07	16.01	16.96	17.90	18.84
250	8.83	9.82	10.99	11.78	12.36	13.15	13.74	14.72	15.70	16.68	17.66	18.64	19.63
260	9.18	10.20	11.43	12.25	12.86	13.68	14.29	15.31	16.33	17.35	18.37	19.39	20.41
280	9.89	10.99	12.31	13.19	13.85	14.73	15.39	16.49	17.58	18.68	19.78	20.88	21.98
300	10.60	11.78	13.19	14.13	14.84	15.78	16.49	17.66	18.84	20.02	21.20	22.37	23.55
320	11.30	12.56	14.07	15.07	15.83	16.83	17.58	18.84	20.08	21.35	22.60	23.86	25.12
340	11.90	13.32	14.95	16.02	16.82	17.88	18.67	20.02	21.35	22.69	23.98	25.36	26.64
350	12.37	13.74	15.39	16.48	17.31	18.41	19.23	20.61	21.98	23.35	24.74	26.10	27.48
360	12.72	14.13	15.83	16.96	17.80	18.93	19.78	21.20	22.61	24.02	25.43	26.85	28.26
380	13.43	14.92	16.71	17.90	18.79	19.97	20.90	22.37	23.86	25.35	26.86	28.34	29.84
400	14.13	15.70	17.58	18.84	19.78	21.04	21.90	23.55	25.12	26.69	28.26	29.83	31.40
420	14.84	16.49	18.46	19.78	20.77	22.09	23.08	24.73	26.38	28.03	29.67	31.32	32.97
450	15.68	17.66	19.78	21.20	22.26	23.67	24.73	26.49	28.26	30.03	31.79	33.56	35.33
480	17.00	18.84	21.10	22.60	23.74	25.25	26.38	28.26	30.14	32.03	33.91	35.80	37.68
500	17.66	19.63	21.98	23.55	24.73	26.30	27.48	29.44	31.40	33.36	35.32	37.29	39.25
530	18.72	20.80	23.30	24.49	26.21	27.88	29.12	31.20	33.28	35.36	37.45	39.53	41.61
560	19.78	21.98	24.62	26.37	27.70	29.45	30.77	32.97	35.17	37.37	39.56	41.76	43.96
600	21.20	23.55	26.38	28.26	29.67	31.56	32.97	35.33	37.56	40.04	42.39	44.75	47.10
630	22.26	24.73	27.70	29.67	31.16	33.14	34.62	37.09	39.56	42.04	44.51	46.86	49.46

Continued

Width, mm	Thickness, mm												
	4.50	5.00	5.60	6.00	6.30	6.70	7.00	7.50	8.00	8.50	9.00	9.50	10.00
	Weight per linear metre, kg												
650	22.97	25.52	28.57	30.61	32.15	34.19	35.71	38.27	40.82	43.37	45.94	48.47	51.04
670	23.67	26.30	29.45	31.56	33.14	35.24	36.82	39.45	42.08	44.71	47.34	49.97	52.60
710	25.08	27.86	31.21	33.44	35.11	37.34	39.01	41.80	44.59	47.37	50.16	52.95	55.74
750	26.49	29.44	32.97	35.33	37.09	39.45	41.21	44.16	47.10	50.04	52.99	55.93	58.88
800	28.26	31.40	35.17	37.68	39.56	42.08	43.96	47.10	50.24	53.38	56.52	59.66	62.80
850	30.03	33.36	37.37	40.04	42.04	44.71	46.71	50.04	53.38	56.72	60.05	63.39	66.70
900	31.79	35.33	39.56	42.39	44.51	47.34	49.46	52.99	56.52	60.05	63.59	67.12	70.65
950	33.56	37.29	41.76	44.76	46.98	49.97	52.20	55.93	59.66	63.39	67.12	70.85	74.58
1000	35.33	39.25	43.96	47.10	49.46	52.60	54.95	58.88	62.80	66.73	70.65	74.58	78.50
1100	38.86	43.18	48.36	51.82	54.40	57.86	60.45	64.76	69.09	73.40	70.73	82.03	86.35
1250	44.16	49.06	54.95	58.88	61.82	65.74	68.69	73.59	78.50	83.41	88.31	93.22	98.13
1400	49.00	54.95	61.54	65.94	69.24	73.63	76.93	82.43	87.92	93.42	98.91	104.41	109.90
1500	52.97	58.88	65.94	70.65	74.18	78.89	82.43	88.31	94.20	100.09	106.00	111.86	117.80
1600	56.52	62.80	70.34	75.36	79.13	84.15	87.89	94.20	100.50	106.76	113.00	119.30	125.60
1700	60.05	66.73	74.73	80.07	84.07	89.41	93.42	100.08	106.80	113.43	120.10	126.78	130.50
1800	63.59	70.65	79.13	84.78	89.02	94.67	98.91	105.96	113.00	120.11	127.20	134.24	141.30
1900	67.12	74.58	83.52	89.49	93.97	99.93	104.4	111.86	119.30	126.78	134.20	141.69	149.20
2000	70.65	78.50	87.92	94.20	98.91	105.19	109.9	117.75	125.60	133.45	141.30	149.15	157.00
2100	74.19	82.43	92.32	98.92	103.86	110.45	115.4	123.60	132.90	140.10	148.40	156.60	164.90
2200	77.72	86.35	96.71	103.60	108.80	115.71	120.9	129.50	139.30	146.80	155.40	164.10	172.70
2300	82.26	90.28	101.11	108.30	113.75	120.97	126.4	135.40	146.40	153.70	162.50	171.50	180.60

COLD-ROLLED STEEL STRIP, COILS

ГОСТ 8596-57

Dimensions

Width, mm	Thickness, mm																
	0.20	0.22	0.25	0.28	0.30	0.32	0.35	0.36	0.40	0.45	0.50	0.56	0.60	0.63	0.70	0.80	0.90
	Weight per linear metre, kg																
200	0.314	0.345	0.393	0.440	0.471	0.502	0.550	0.565	0.628	0.707	0.785	0.879	0.942	0.989	1.10	1.26	1.41
210	0.330	0.363	0.412	0.462	0.494	0.528	0.579	0.623	0.659	0.742	0.824	0.923	0.989	0.04	1.15	1.32	1.48
220	0.345	0.380	0.432	0.482	0.518	0.553	0.604	0.622	0.691	0.777	0.864	0.967	1.036	1.09	1.21	1.38	1.55
240	0.377	0.414	0.471	0.528	0.566	0.603	0.659	0.678	0.754	0.848	0.942	1.06	1.130	1.19	1.32	1.51	1.70
250	0.393	0.432	0.491	0.550	0.589	0.628	0.687	0.707	0.785	0.883	0.981	1.10	1.178	1.23	1.37	1.57	1.77
260	0.408	0.449	0.510	0.571	0.612	0.612	0.714	0.735	0.816	0.919	1.02	1.14	1.230	1.29	1.43	1.63	1.84
280	0.440	0.484	0.550	0.615	0.659	0.659	0.769	0.791	0.879	0.989	1.10	1.23	1.320	1.39	1.54	1.76	1.98
300	0.471	0.518	0.589	0.659	0.706	0.706	0.824	0.848	0.942	1.06	1.18	1.32	1.410	1.48	1.65	1.88	2.12
320	0.502	0.552	0.698	0.706	0.754	0.803	0.879	0.904	1.01	1.13	1.26	1.41	1.51	1.58	1.76	2.01	2.26
340	0.533	0.586	0.666	0.748	0.801	0.854	0.933	0.961	1.07	1.20	1.34	1.50	1.57	1.68	1.87	2.14	2.40
350	0.550	0.605	0.687	0.770	0.824	0.879	0.962	0.989	1.10	1.24	1.37	1.54	1.65	1.73	1.92	2.20	2.47
360	0.565	0.622	0.707	0.791	0.848	0.904	0.989	1.02	1.13	1.27	1.41	1.58	1.70	1.78	1.98	2.26	2.54
380	0.597	0.657	0.746	0.835	0.896	0.955	1.04	1.07	1.19	1.34	1.49	1.67	1.79	1.90	2.09	2.39	2.69
400	0.667	0.691	0.785	0.879	0.942	1.01	1.10	1.13	1.26	1.41	1.57	1.76	1.88	1.98	2.20	2.51	2.83
420	0.659	0.725	0.824	0.923	0.989	1.06	1.15	1.19	1.32	1.48	1.65	1.85	2.00	2.08	2.31	2.64	2.97
450	0.707	0.778	0.883	0.989	1.06	1.13	1.24	1.27	1.41	1.59	1.77	1.98	2.12	2.23	2.47	2.83	3.18
480	0.754	0.829	0.942	1.06	1.13	1.21	1.32	1.36	1.51	1.70	1.88	2.11	2.26	2.37	2.69	3.01	3.39
500	0.785	0.864	0.984	1.10	1.18	1.26	1.37	1.41	1.57	1.77	1.96	2.20	2.36	2.47	2.75	3.14	3.53
530	0.832	0.915	1.04	1.17	1.25	1.33	1.46	1.50	1.66	1.87	2.08	2.33	2.50	2.62	2.91	3.33	3.75
560	0.879	0.967	1.10	1.23	1.32	1.41	1.54	1.58	1.76	1.98	2.20	2.46	2.64	2.77	3.08	3.52	3.96

Continued

Width, mm	Thickness, mm																
	0.20	0.22	0.25	0.28	0.30	0.32	0.35	0.36	0.40	0.45	0.50	0.56	0.60	0.63	0.70	0.80	0.90
	Weight per linear metre, kg																
600	0.942	1.04	1.18	1.32	1.41	1.51	1.65	1.70	1.88	2.12	2.36	2.64	2.83	2.97	3.30	3.77	4.24
630	0.989	1.09	1.24	1.40	1.48	1.58	1.73	1.78	1.98	2.23	2.47	2.77	2.97	3.12	3.46	3.96	4.45
650	1.02	1.12	1.28	1.43	1.53	1.63	1.79	1.84	2.04	2.30	2.55	2.86	3.06	3.22	3.57	4.08	4.59
670	1.05	1.16	1.32	1.47	1.58	1.68	1.84	1.89	2.10	2.37	2.63	2.95	3.16	3.31	3.68	4.21	4.73
710	1.12	1.23	1.39	1.56	1.67	1.78	1.95	2.00	2.23	2.51	2.79	3.12	3.34	3.51	3.90	4.46	5.02
750	1.18	1.30	1.47	1.65	1.77	1.88	2.06	2.12	2.36	2.65	2.94	3.30	3.53	3.71	4.12	4.71	5.30
800	1.26	1.38	1.57	1.76	1.88	2.01	2.20	2.26	2.51	2.83	3.14	3.52	3.77	3.96	4.40	5.02	5.65
850	1.34	1.47	1.67	1.87	2.00	2.14	2.34	2.40	2.67	3.00	3.34	3.74	4.00	4.20	4.67	5.34	6.01
900	1.41	1.55	1.77	1.98	2.12	2.26	2.47	2.54	2.83	3.18	3.53	4.00	4.24	4.45	4.95	5.65	6.36
950	—	—	—	—	—	—	2.61	2.69	2.98	3.36	3.73	4.18	4.48	4.50	5.52	5.97	6.71
1000	—	—	—	—	—	—	2.75	2.83	3.14	3.53	3.93	4.40	4.71	4.95	5.50	6.28	7.07
1100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.77
1250	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8.83
1400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9.89
1500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10.60
1600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11.30
1700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12.00
1800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12.70
1900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Continued

Width, mm	Thickness, mm															
	1.00	1.10	1.20	1.40	1.50	1.60	1.80	2.00	2.20	2.50	2.80	3.00	3.20	3.50	3.60	4.00
	Weight per linear metre, kg															
200	1.57	1.73	1.88	2.20	2.36	2.51	2.83	3.14	3.45	3.93	4.40	4.71	5.02	5.50	5.65	6.28
210	1.65	1.81	1.98	2.31	2.47	2.64	2.97	3.30	3.63	4.12	4.62	4.95	5.28	5.80	5.94	6.59
220	1.73	1.90	2.07	2.42	2.59	2.76	3.11	3.45	3.80	4.32	4.84	5.18	5.53	6.05	6.22	6.91
240	1.88	2.07	2.26	2.64	2.83	3.01	3.39	3.77	4.15	4.72	5.28	5.65	6.03	6.59	6.78	7.54
250	1.96	2.16	2.36	2.75	2.94	3.14	3.53	3.93	4.32	4.91	5.50	5.89	6.28	6.87	7.07	7.85
260	2.04	2.25	2.45	2.86	3.06	3.27	3.67	4.08	4.50	5.10	5.72	6.12	6.53	7.14	7.35	8.16
280	2.20	2.42	2.64	3.08	3.30	3.52	3.96	4.40	4.84	5.50	6.15	6.59	7.03	7.69	7.91	8.79
300	2.36	2.59	2.83	3.30	3.53	3.77	4.24	4.71	5.18	5.89	6.59	7.07	7.54	8.24	8.48	9.42
320	2.51	2.76	8.01	3.52	3.77	4.02	4.52	5.02	5.53	6.28	7.03	7.54	8.03	8.79	9.04	10.04
340	2.67	2.94	3.20	3.74	4.00	4.27	4.80	5.34	5.87	6.67	7.47	8.01	8.54	9.34	9.61	10.66
350	2.75	3.02	3.30	3.85	4.12	4.40	4.95	5.50	6.05	6.87	7.69	8.24	8.79	9.62	9.89	10.99
360	2.83	3.11	3.39	3.96	4.24	4.52	5.09	5.65	6.22	7.07	7.91	8.48	9.04	9.89	10.13	11.30
380	2.98	3.28	3.58	4.18	4.48	4.77	5.37	5.97	6.56	7.46	8.35	8.95	9.55	10.44	10.74	11.94
400	3.14	3.45	3.77	4.40	4.71	5.02	5.65	6.28	6.91	7.85	8.80	9.42	10.05	10.99	11.30	12.56
420	3.30	3.63	3.96	4.62	4.95	5.28	5.94	6.59	7.25	8.24	9.23	9.89	10.55	11.54	11.87	13.19
450	3.53	3.89	4.24	4.95	5.30	5.65	6.36	7.07	7.77	8.83	9.90	10.60	11.30	12.36	12.70	14.13
480	3.77	4.15	4.52	5.28	5.65	6.03	6.78	7.54	8.29	9.42	10.55	11.30	12.06	13.19	13.56	15.07
500	3.93	4.32	4.71	5.50	5.89	6.28	7.07	7.85	8.64	9.81	10.99	11.78	12.56	13.74	14.13	15.70
530	4.16	4.58	4.99	5.83	6.24	6.66	7.49	8.32	9.16	10.40	11.66	12.48	13.31	14.56	14.98	16.64
560	4.40	4.84	5.26	6.15	6.59	7.03	7.91	8.79	9.68	10.99	12.31	13.19	14.07	15.39	15.83	17.58
600	4.71	5.18	5.65	6.59	7.07	7.54	8.48	9.42	10.36	11.78	13.18	14.13	15.07	16.49	17.00	18.84
630	4.95	5.44	5.94	6.92	7.42	7.91	8.90	9.89	10.88	12.36	13.85	14.84	15.83	17.31	17.80	19.78

Continued

Width, mm	Thickness, mm															
	1.00	1.10	1.20	1.40	1.50	1.60	1.80	2.00	2.20	2.50	2.80	3.00	3.20	3.50	3.60	4.00
	Weight per linear metre, kg															
650	5.10	5.61	6.12	7.14	7.65	8.16	9.19	10.21	11.23	12.76	14.28	15.31	16.33	17.86	18.37	20.41
670	5.26	5.79	6.31	7.36	7.89	8.42	9.47	10.52	11.58	13.15	14.72	15.78	16.83	18.41	18.93	21.04
710	5.57	6.13	6.69	7.80	8.36	8.92	10.04	11.15	12.26	13.93	15.61	16.72	17.84	19.51	20.07	22.29
750	5.89	6.48	7.07	8.24	8.83	9.42	10.60	11.78	12.95	14.72	16.48	17.66	18.84	20.61	21.20	23.55
800	6.28	6.91	7.54	8.79	9.42	10.04	11.30	12.56	13.82	15.70	17.58	18.84	20.10	22.00	22.61	25.12
850	6.67	7.34	8.01	9.34	10.01	10.68	12.01	13.35	14.68	16.68	18.68	20.02	21.35	23.35	24.02	26.69
900	7.07	7.77	8.48	9.90	10.60	11.30	12.72	14.13	15.54	17.66	19.78	21.20	22.61	24.72	25.43	29.26
950	7.46	8.20	8.95	10.44	11.19	11.93	13.42	14.92	16.41	18.64	20.88	22.37	23.86	26.10	26.90	29.83
1000	7.86	8.64	9.42	10.99	11.78	12.56	14.13	15.70	17.27	19.63	21.98	23.55	25.12	27.46	28.30	31.40
1100	8.63	9.50	10.36	12.09	12.95	13.82	15.54	17.27	19.00	21.59	24.18	25.91	27.63	30.22	31.09	34.54
1250	9.81	10.79	11.78	13.74	14.72	15.70	17.66	19.63	21.59	24.53	27.47	29.44	31.40	34.34	35.33	39.25
1400	11.00	12.09	13.19	15.39	16.48	17.58	19.78	21.98	24.18	27.48	30.77	32.97	35.17	38.47	39.60	43.96
1500	11.78	12.95	14.13	16.49	17.66	18.84	21.20	23.55	25.91	29.44	32.98	35.33	37.68	41.21	42.40	47.00
1600	12.56	13.82	15.07	17.58	18.84	20.10	22.61	25.12	27.63	31.40	35.16	37.68	40.19	43.96	45.20	50.24
1700	13.35	14.68	16.01	18.68	20.02	21.35	24.02	26.69	29.36	33.36	37.37	40.04	42.70	46.71	48.04	53.38
1800	14.13	15.54	16.96	19.78	21.20	22.61	25.43	28.26	31.09	35.33	39.56	42.39	45.22	49.46	50.90	56.52
1900	—	16.41	17.90	20.88	22 37	23.84	26.85	29.83	32.82	37.29	41.76	44.76	47.73	52.20	53.69	59.66
2000	—	17.27	18.84	21.98	23.55	25.12	28.26	31.40	34.54	39.25	43.96	47.10	50.24	54.95	56.50	62.80
2100	—	—	—	23.08	24.73	26.38	29.67	32.97	36.27	41.21	46.16	49.46	52.75	57.70	59.35	65.94
2200	—	—	—	24.18	25.91	27.63	31.09	34.54	38.00	43.18	48.36	51.81	55.26	60.45	62.20	69.08
2300	—	—	—	25.28	27.08	28.89	32.50	36.11	39.72	45.14	50.55	54.17	57.78	63.19	65.00	73.22

STAINLESS STEEL STRIP

ГОСТ 4986-54

Thickness of Strip

Thickness	Semi-work-hardened, work-hardened and special work-hardened		Soft strip	
	Width of strip			
	up to 400	over 400	up to 400	over 400
	Permissible deviation in thickness of strip			
mm				
0.10	−0.02	—	−0.03	—
0.12 0.15	−0.03	—	−0.04	—
0.20 0.25	−0.03	—	−0.05	—
0.30 0.35 0.40 0.45	−0.04	—	−0.06	—
0.50 0.55 0.60 0.65	−0.05	−0.07	−0.07	−0.09
0.70 0.75 0.80 0.90	−0.06	−0.09	−0.08	−0.11
1.00 1.10 1.20	−0.08	−0.12	−0.10	−0.14
1.30 1.50	−0.10	−0.14	−0.12	−0.16
1.65 1.80	−0.13	−0.16	−0.15	−0.18
2.00	−0.16	−0.18	−0.18	−0.20

Length of strip minimum 4 m, width from 40 to 600 mm at intervals of 5 mm.

Mechanical Properties as Delivered

Grade of steel	Condition of strip as supplied	Tensile strength, kg/mm²	Elongation, %
		minimum	
1Х13	Soft	40	21
2Х13	Soft	50	20
3Х13	Soft	50	20
0Х18Н9	Soft	54	45
	Semi-work-hardened	75—95	25
1Х18Н9	Soft	54	35
	Semi-work-hardened	80	20
	Work-hardened	100	13
	Special work-hardened	115	8
2Х18Н9	Soft	58	35
	Semi-work-hardened	80	20
	Work-hardened	100	13
	Special work-hardened	115	8
1Х18Н9Т	Soft	54	40
1Х18Н11Б	Soft	54	40
	Work-hardened	100	13
Х13Н4Г9	Soft	60	40
	Semi-work-hardened	80	20
	Work-hardened	100	15
	Special work-hardened	115	8
Х23Н18	Soft	58	45

Work-hardened and special work-hardened strip (thickness 0.2 mm and over) shall withstand two bends round jaws of a radius equal to five times the thickness of the strip without causing fissures, tears, laminations or fractures; work-hardened and semi-work-hardened strip (thickness less than 0.2 mm) shall withstand three bends under the same conditions.

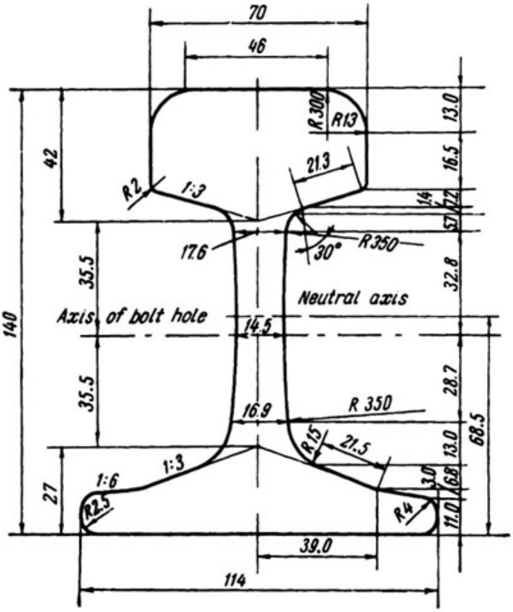
At buyer's request strip of steel, grades 1Х13, 2Х13 and 3Х13, shall withstand bending through 180° round arbor whose thickness is equal to thickness of strip without causing fissures or laminations.

Strip of steel, grades 0Х18Н9, 1Х18Н9, 2Х18Н9, 1Х18Н9Т, 1Х18Н11Б and Х13Н4Г9, shall withstand tests for intercrystalline corrosion.

STEEL SHAPES FOR RAILWAY TRANSPORT

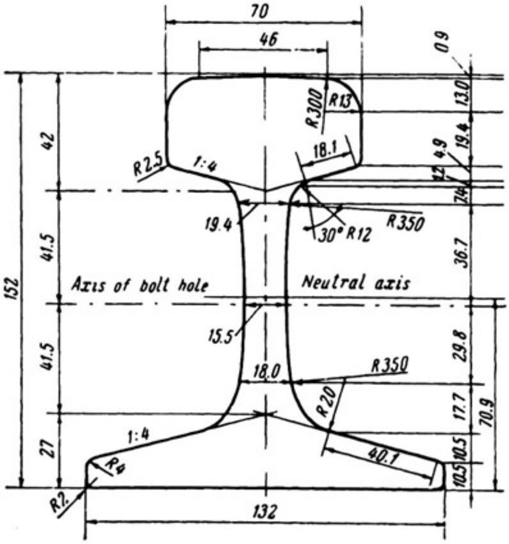
Broad-Gauge Railway Rails, Type P-43

ГОСТ 7173-54


70
46
R300
R13
13.0
42
16.5
21.3
R2
1:3
1.4
1.2
5.7
17.6
30°
R350
140
35.5
32.8
Neutral axis
Axis of bolt hole
14.5
35.5
28.7
R 350
16.9
R15
21.5
13.0
68.5
27
1:6
1:3
3.0
6.8
R2.5
R4
11.0
39.0
114

Broad-Gauge Railway Rails, Type P-50

ГОСТ 7174-54


70
46
0.9
13.0
19.4
4.9
2.2
7.4
36.7
29.8
17.7
70.9
10.5
10.5
R300
R13
18.1
R2.5
1:4
42
41.5
41.5
27
152
19.4
30°
R12
R350
Axis of bolt hole
Neutral axis
15.5
18.0
R350
R20
1:4
40.1
R4
R2
132

Standard length of rails 12.5 and 25 m; short lengths (for curves): 12.46; 12.42; 12.38 and 24.96; 24.92 and 24.84 m.

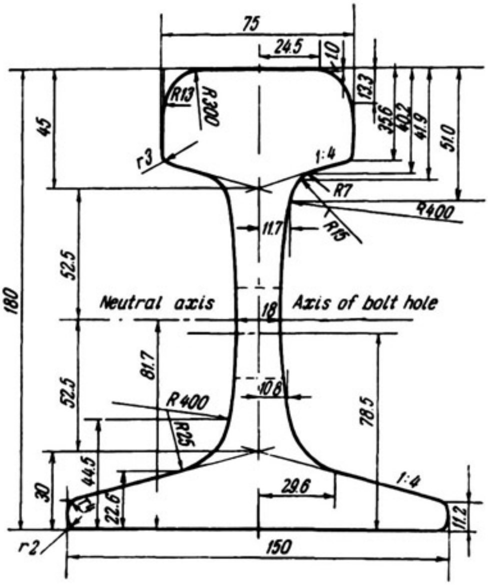
Permissible Deviations in Dimensions, mm:

height and bulge of head	±0.5
width of head	±0.5
thickness of web	+0.75 −0.5
width of base	+1.00 −2.0

63-2

Broad-Gauge Railway Rails, Type P-65

ГОСТ 8161-56


75
24.5
1.0
13.3
35.6
40.2
41.9
51.0
R13
R300
r3
1:4
45
R7
R400
11.7
R15
180
52.5
Neutral axis
18
Axis of bolt hole
81.7
10.8
52.5
R400
R25
78.5
44.5
30
22.6
29.6
1:4
11.2
r2
150

height of web	+0.30 —0.5
height of rail	+0.80 —0.5
length of rail	±6.00
dimensions of holes	±1.00

Rail Characteristics

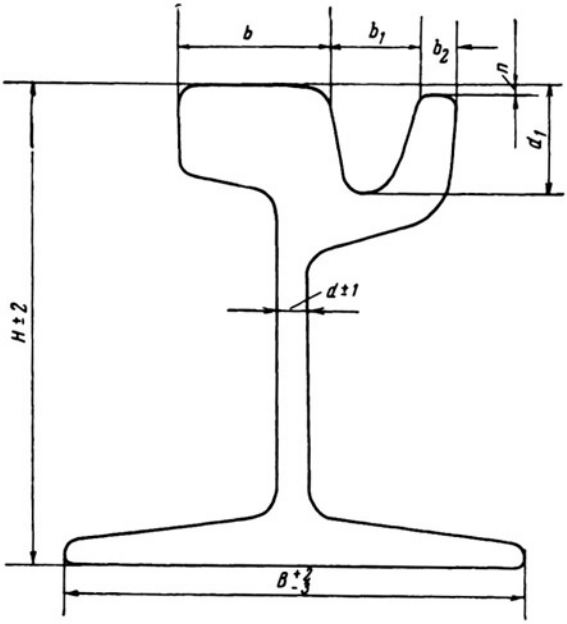
Type	Cross-section area, cm^2	Moment of inertia, cm^4		Theoretical weight, kg			Distribution of metal in rail (% of cross-section area)		
				without holes		weight of steel corresponding to holes			
		I_X	I_Y	1 linear metre	12.5 m rail		head	web	base
P-43	57.0	1489	260	44.65	558.16	0.470	42.83	21.31	35.86
P-50	65.8	2037	377	51.51	643.92	0.496	38.68	23.77	37.55
P-65	82.92	3573	572	64.93	811.62	0.530	34.50	28.30	37.20

Tram Rails, Grooved

ГОСТ 6544-53

Length 12.5m ± 10 mm

Type	H	B	b	b_1	b_2	d_1	n	d	Area of section, F, cm^2	Moment of inertia, I_X, cm^4	Theoretical weight, kg (without holes)	
											1 linear metre	12.5 m rail
Тн-55	160	160	58	35	14	40	−4	12	70.56	2416.9	55.39	692.37
Тн-60	160	160	58	35	23	38	+5	12	76.39	2617	59.97	749.62
Тв-60	180	180	58	35	14	40	−4	12	76.72	3549.6	60.14	751.75
Тв-65	180	180	58	35	23	38	+5	12	82.55	3835	64.80	810.00


b
b1
b2
n
d1
H ±2
d ±1
B +2 -3

ELECTRIC WELDED STEEL PIPE, DIAMETER 426—1,620 mm

ГОСТ 4015-58

Nominal inside diameter, mm	Outside diameter		Thickness of wall, mm													
	nominal	permissible deviation	4	4.5	5	6	7	8	9	10	11	12	(13)	14	(15)	16
	mm		Theoretical weight per linear metre, kg (at specific weight of steel 7.85)													
400	426	±4.5	41.63	46.78	51.91	62.15	72.33	82.47	92.56	102.6	112.6	122.5	—	—	—	—
450	478	±5.0	46.76	52.55	58.33	69.84	81.31	92.73	104.1	115.4	126.7	137.9	—	—	—	—
500	529	±5.5	51.79	58.21	64 61	77.39	90.11	102.9	115.4	128.0	140.5	153.0	—	—	—	—
600	630	±6.5	61.75	69.42	77.07	92.33	107.5	122.7	137.8	152.9	167.9	182.9	—	—	—	—
700	720	±6.5	—	—	88.17	105.7	123.1	140.5	157.8	175.1	192.3	209.5	—	—	—	—
800	820	±7.0	—	—	100.5	120.5	140.3	160.2	180.0	199.8	219.5	239.1	258.7	278.3	297.8	317.3
900	920	±7.5	—	—	112.8	135.2	157.6	179.9	202.2	224.4	246.6	268.7	290.8	312.8	334.8	356.7
1000	1020	±8.5	—	—	125.2	150.0	174.9	199.7	224.4	249.1	273.7	298.3	322.8	347.3	371.8	396.2
1100	1120	±9.0	—	—	—	164.8	192.1	219.4	246.6	273.7	300.8	327.9	354.9	381.9	408.8	435.6
1200	1220	±9.0	—	—	—	179.6	209.4	239.1	268.8	298.4	328.0	357.5	387.0	416.4	445.8	475.1
(1300)	1320	±9.0	—	—	—	194.4	226.7	258.9	291.0	323.0	355.1	387.1	419.0	450.9	482.8	514.5
1400	1420	±9.5	—	—	—	209.2	243.9	278.6	313.2	347.7	382.2	416.7	451.1	485.4	519.7	554.0
(1500)	1520	±10	—	—	—	—	—	—	—	372.4	409.4	446.3	483.1	520.0	556.7	593.5
1600	1620	±10	—	—	—	—	—	—	—	397.1	436.5	475.9	515.2	554.5	593.7	632.9

Length of pipe:

for group A . . . . . 10—24 m
for group B . . . . . 5—24 m

The curvature of the pipe shall not exceed 1.5 mm per linear metre.

HOT-ROLLED SEAMLESS STEEL PIPE

ГОСТ 8732-58

Dimensions

Outside diameter, mm	Thickness of wall, mm												
	2.5	2.8	3	3.5	4	4.5	5	5.5	6	(6.5)	7	(7.5)	8
	Theoretical weight per linear metre, kg												
25	1.39	1.53	1.63	1.86	2.07	2.28	2.47	2.64	2.81	2.97	3.11	3.24	3.35
28	1.57	1.74	1.85	2.11	2.37	2.61	2.84	3.05	3.26	3.45	3.63	3.79	3.94
32	1.76	2.02	2.15	2.46	2.76	3.05	3.33	3.59	3.85	4.09	4.32	4.53	4.74
38	2.19	2.43	2.59	2.98	3.35	3.72	4.07	4.41	4.74	5.05	5.35	5.64	5.92
42	2.44	2.70	2.89	3.32	3.75	4.16	4.56	4.95	5.33	5.69	6.04	6.38	6.71
45	2.62	2.91	3.11	3.58	4.04	4.49	4.93	5.36	5.77	6.17	6.56	6.94	7.30
50	2.93	3.25	3.48	4.01	4.54	5.05	5.55	6.04	6.51	6.97	7.42	7.86	8.29
54	—	—	3.77	4.36	4.93	5.49	6.04	6.58	7.10	7.61	8.11	8.60	9.08
57	—	—	4.00	4.62	5.23	5.83	6.41	6.99	7.55	8.10	8.63	9.16	9.67
60	—	—	4.22	4.88	5.52	6.16	6.78	7.39	7.99	8.58	9.15	9.71	10.26
63.5	—	—	4.48	5.18	5.87	6.55	7.21	7.87	8.51	9.14	9.75	10.36	10.95
68	—	—	4.81	5.57	6.31	7.05	7.77	8.48	9.17	9.86	10.53	11.19	11.84
70	—	—	4.96	5.74	6.51	7.27	8.01	8.75	9.47	10.18	10.88	11.56	12.23
73	—	—	5.18	6.00	6.81	7.60	8.38	9.16	9.91	10.66	11.39	12.11	12.82
76	—	—	5.40	6.26	7.10	7.93	8.75	9.50	10.36	11.14	11.91	12.67	13.42
83	—	—	—	6.86	7.79	8.71	9.62	10.51	11.39	12.26	13.12	13.96	14.80
89	—	—	—	7.38	8.38	9.38	10.36	11.33	12.28	13.22	14.16	15.07	15.98
95	—	—	—	7.90	8.98	10.04	11.10	12.14	13.17	14.19	15.19	16.18	17.16
102	—	—	—	8.50	9.67	10.82	11.96	13.09	14.21	15.31	16.40	17.48	18.55
108	—	—	—	—	10.26	11.49	12.70	13.90	15.09	16.27	17.44	18.59	19.73
114	—	—	—	—	10.85	12.15	13.44	14.72	15.98	17.23	18.47	19.70	20.91
121	—	—	—	—	11.54	12.93	14.30	15.67	17.02	18.35	19.68	20.99	22.29

127	—	—	—	—	12.13	13.59	15.04	16.48	17.90	19.32	20.72	22.10	23.48
133	—	—	—	—	12.73	14.26	15.78	17.29	18.79	20.28	21.75	23.21	24.66
140	—	—	—	—	—	15.04	16.65	18.24	19.83	21.40	22.96	24.51	26.04
146	—	—	—	—	—	15.70	17.39	19.06	20.72	22.36	24.00	25.62	27.23
152	—	—	—	—	—	16.37	18.13	19.87	21.60	23.32	25.03	26.73	28.41
159	—	—	—	—	—	17.15	18.99	20.82	22.64	24.45	26.24	28.02	29.79
168	—	—	—	—	—	—	20.10	22.04	23.97	25.89	27.79	29.69	31.57
180	—	—	—	—	—	—	21.59	23.70	25.75	27.70	29.87	31.91	33.93
194	—	—	—	—	—	—	23.31	25.60	27.82	30.00	32.28	34.50	36.70
203	—	—	—	—	—	—	—	—	29.14	31.50	33.83	36.16	38.47
219	—	—	—	—	—	—	—	—	31.52	34.06	36.60	39.12	41.63
245	—	—	—	—	—	—	—	—	—	38.23	41.09	43.85	46.76
273	—	—	—	—	—	—	—	—	—	42.64	45.92	49.10	52.28
299	—	—	—	—	—	—	—	—	—	—	—	53.91	57.41
325	—	—	—	—	—	—	—	—	—	—	—	58.74	62.54
351	—	—	—	—	—	—	—	—	—	—	—	—	67.67
377	—	—	—	—	—	—	—	—	—	—	—	—	—
402	—	—	—	—	—	—	—	—	—	—	—	—	—
426	—	—	—	—	—	—	—	—	—	—	—	—	—
450	—	—	—	—	—	—	—	—	—	—	—	—	—
(465)	—	—	—	—	—	—	—	—	—	—	—	—	—
480	—	—	—	—	—	—	—	—	—	—	—	—	—
500	—	—	—	—	—	—	—	—	—	—	—	—	—
530	—	—	—	—	—	—	—	—	—	—	—	—	—
(550)	—	—	—	—	—	—	—	—	—	—	—	—	—
560	—	—	—	—	—	—	—	—	—	—	—	—	—
600	—	—	—	—	—	—	—	—	—	—	—	—	—
630	—	—	—	—	—	—	—	—	—	—	—	—	—
710	—	—	—	—	—	—	—	—	—	—	—	—	—
800	—	—	—	—	—	—	—	—	—	—	—	—	—

Continued

Outside diameter, mm	Thickness of wall, mm											
	(8.5)	9	(9.5)	10	11	12	(13)	14	(15)	16	(17)	18
	Theoretical weight per linear metre, kg											
25	—	—	—	—	—	—	—	—	—	—	—	—
28	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	—	—
38	—	—	—	—	—	—	—	—	—	—	—	—
42	7.02	7.32	7.60	7.88	—	—	—	—	—	—	—	—
45	7.65	7.99	8.32	8.63	—	—	—	—	—	—	—	—
50	8.70	9.10	9.49	9.86	—	—	—	—	—	—	—	—
54	9.54	9.99	10.43	10.85	11.67	—	—	—	—	—	—	—
57	10.17	10.65	11.13	11.59	12.48	13.32	14.11	—	—	—	—	—
60	10.80	11.32	11.83	12.33	13.29	14.21	15.07	15.88	—	—	—	—
63.5	11.53	12.10	12.65	13.19	14.24	15.24	16.19	17.09	—	—	—	—
68	12.47	13.10	13.71	14.30	15.46	16.57	17.63	18.64	19.61	20.52	—	—
70	12.89	13.54	14.17	14.80	16.01	17.16	18.27	19.33	20.35	21.31	—	—
73	13.52	14.21	14.88	15.54	16.82	18.05	19.24	20.37	21.46	22.49	23.48	24.41
76	14.15	14.87	15.58	16.28	17.63	18.94	20.20	21.41	22.57	25.68	24.74	25.75
83	15.62	16.42	17.22	18.00	19.53	21.01	22.44	23.82	25.15	26.44	27.67	28.85
89	16.87	17.76	18.63	19.48	21.16	22.79	24.37	25.89	27.37	28.80	30.19	31.52
95	18.13	19.09	20.03	20.96	22.79	24.56	26.29	27.97	29.59	31.17	32.70	34.18
102	19.60	20.64	21.67	22.69	24.69	26.63	28.53	30.38	32.18	33.93	35.64	37.29
108	20.86	21.97	23.08	24.17	26.31	28.41	30.46	32.45	34.40	36.30	38.15	39.95
114	22.12	23.31	24.48	25.65	27.94	30.19	32.38	34.53	36.62	38.67	40.67	42.62
121	23.58	24.86	26.12	27.37	29.84	32.26	34.62	36.94	39.21	41.43	43.60	45.72
127	24.84	26.19	27.53	28.85	31.47	34.03	36.55	39.01	41.43	43.80	46.12	48.39

133	26.10	27.52	28.93	30.33	33.10	35.81	38.41	41.00	43.65	46.17	48.63	51.65
140	27.57	29.08	30.57	32.06	34.99	37.88	40.72	43.50	46.24	48.93	51.57	54.16
146	28.82	30.41	31.98	33.54	36.62	39.66	42.64	45.57	48.46	51.30	54.08	56.82
152	30.08	31.74	33.39	35.02	38.25	41.43	44.56	47.65	50.68	53.66	56.60	59.48
159	31.55	33.29	35.03	36.75	40.15	43.50	46.81	50.06	53.27	56.43	59.53	62.59
168	33.43	35.29	37.13	38.97	42.59	46.17	49.69	53.17	56.60	59.98	63.31	66.59
180	35.95	37.95	39.95	41.92	45.85	49.72	53.54	57.31	61.04	64.71	68.34	71.91
194	38.89	41.06	43.23	45.38	49.64	53.86	58.03	62.15	66.22	70.24	74.21	78.13
203	40.77	43.05	45.33	47.59	52.08	56.52	60.91	65.94	69.54	73.78	77.97	82.12
219	44.12	46.61	49.08	51.54	56.43	61.26	66.04	70.78	75.46	80.10	84.69	89.23
245	49.56	52.38	55.17	57.95	63.48	68.95	74.38	79.76	85.08	90.36	95.59	100.77
273	55.45	58.60	61.73	64.86	71.07	77.24	83.36	89.42	95.44	101.41	107.33	113.20
299	60.89	64.37	67.83	71.27	78.13	84.93	91.69	98.40	105.06	111.67	118.23	124.74
325	66.35	70.14	73.92	77.68	85.18	92.63	100.03	107.38	114.68	121.93	129.13	136.28
351	71.80	75.91	80.01	84.10	92.23	100.32	108.36	116.35	124.29	132.19	140.03	147.82
377	—	81.68	86.10	90.51	99.29	108.02	117.00	125.33	133.91	142.44	150.93	159.36
402	—	87.21	91.95	96.67	106.06	115.41	124.71	133.94	143.15	152.30	161.40	170.45
426	—	92.55	97.57	102.59	112.58	122.52	132.41	142.25	152.04	161.78	171.47	181.11
450	—	97.87	103.20	108.50	119.08	130.61	140.09	150.52	160.90	171.24	181.52	191.76
(465)	—	101.10	106.48	112.20	123.15	134.05	144.90	155.70	166.46	—	—	—
480	—	104.52	110.22	115.90	127.22	139.49	149.71	160.88	172.00	—	—	—
500	—	108.96	114.91	120.83	132.65	145.41	156.12	167.79	179.40	—	—	—
530	—	115.62	121.94	128.23	140.78	154.29	165.74	178.14	190.50	—	—	—
(550)	—	120.07	126.62	133.16	146.21	159.20	172.15	185.05	197.90	—	—	—
560	—	122.28	128.97	135.63	148.92	163.16	175.36	188.50	201.60	—	—	—
600	—	131.17	138.34	145.50	159.78	175.00	188.18	202.31	216.39	—	—	—
630	—	137.81	145.36	152.89	167.91	183.88	197.80	212.67	227.49	—	—	—
710	—	155.57	164.11	172.62	189.61	207.55	223.44	240.29	256.98	—	—	—
800	—	175.57	185.00	194.82	214.04	233.00	252.30	271.36	290.37	—	—	—

Continued

Outside diameter, mm	Thickness of wall, mm											
	(19)	20	22	(24)	25	(26)	28	30	32	(34)	(35)	36
	Theoretical weight per linear metre, kg											
25	—	—	—	—	—	—	—	—	—	—	—	—
28	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	—	—
38	—	—	—	—	—	—	—	—	—	—	—	—
42	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	—	—	—	—	—	—	—
63.5	—	—	—	—	—	—	—	—	—	—	—	—
68	—	—	—	—	—	—	—	—	—	—	—	—
70	—	—	—	—	—	—	—	—	—	—	—	—
73	25.30	—	—	—	—	—	—	—	—	—	—	—
76	26.71	—	—	—	—	—	—	—	—	—	—	—
83	29.99	—	—	—	—	—	—	—	—	—	—	—
89	32.80	34.03	36.35	38.47	—	—	—	—	—	—	—	—
95	35.61	36.99	39.61	42.02	—	—	—	—	—	—	—	—
102	38.89	40.44	43.40	46.17	—	—	—	—	—	—	—	—
108	41.70	43.40	46.66	49.72	51.17	52.58	55.24	—	—	—	—	—
114	44.51	46.36	49.91	53.27	54.87	56.43	59.38	—	—	—	—	—
121	47.79	49.82	53.71	57.41	59.19	60.91	64.22	—	—	—	—	—
127	50.61	52.78	56 97	60.96	62.89	64.76	68.36	71.76	—	—	—	—

133	53.42	55.73	60.22	64.51	66.59	68.61	72.50	76.20	79.71	—	—	—
140	56.70	59.19	64.02	68.66	70.90	73.10	77.34	81.38	85.23	88.88	90.63	92.33
146	59.51	62.15	64.28	72.21	74.60	76.94	81.48	85.82	89.97	93.91	95.81	97.66
152	62.32	65.11	71.59	75.76	78.30	80.79	85.62	90.26	94.70	98.94	100.99	102.99
159	65.60	68.56	74.33	79.90	82.62	85.28	90.46	95.44	100.22	104.81	107.03	109.20
168	69.82	73.00	79.21	85.23	88.16	91.05	96.67	102.10	107.33	112.36	114.80	117.19
180	75.44	78.92	85.72	92.33	95.56	98.74	104.96	110.98	116.80	122.42	125.16	127.85
194	82.00	85.28	93.32	100.62	104.19	107.72	114.63	121.33	127.85	134.16	137.24	140.27
203	86.21	90.26	98.20	105.94	109.74	113.49	120.83	127.99	134.94	141.70	145.00	148.26
219	93.71	98.15	106.88	115.42	119.61	123.75	131.89	139.83	147.57	155.12	158.82	162.47
245	105.90	110.98	120.99	130.80	135.64	140.42	149.84	159.07	168.09	176.92	181.26	185.55
273	119.02	124.79	136.18	147.38	152.90	158.38	169.18	179.78	190.19	200.40	205.43	210.41
299	131.20	137.61	150.29	162.77	168.93	175.05	187.13	199.02	210.71	222.20	227.87	233.50
325	143.38	150.44	164.39	178.15	184.96	191.72	205.09	218.25	231.23	244.00	250.31	256.53
351	155.56	163.26	178.50	193.54	200.99	208.39	223.04	237.49	251.74	265.80	272.76	279.66
377	167.75	176.08	192.61	208.93	217.02	225.06	240.99	256.73	272.26	287.61	295.20	302.77
402	179.45	188.40	206.16	223.72	232.42	241.08	258.24	275.21	291.18	308.55	316.76	324.92
426	190.71	200.25	219.19	237.93	247.23	256.48	274.83	292.98	310.93	328.69	337.49	346.27
450	201.94	212.08	232.20	252.12	262.01	271.85	291.38	310.72	329.84	348.79	358.19	367.53
(465)	—	219.47	240.34	261.00	271.26	281.47	301.74	321.81	341.69	361.37	371.13	380.85
480	—	—	—	—	280.51	291.09	312.10	332.91	353.52	373.94	384.08	394.17
500	—	—	—	—	292.84	303.91	325.91	347.71	369.30	390.71	401.34	411.92
530	—	—	—	—	317.50	323.14	346.62	369.90	392.97	415.87	427.23	438.55
(550)	—	—	—	—	323.66	335.97	360.43	384.70	408.76	432.64	444.50	456.31
560	—	—	—	—	—	—	—	—	—	—	—	—
600	—	—	—	—	—	—	—	—	—	—	—	—
630	—	—	—	—	—	—	—	—	—	—	—	—
710	—	—	—	—	—	—	—	—	—	—	—	—
800	—	—	—	—	—	—	—	—	—	—	—	—

Continued

Outside diameter, mm	Thickness of wall, mm											
	(38)	40	(42)	45	(48)	50	56	60	63	(65)	70	75
	Theoretical weight per linear metre, kg											
25	—	—	—	—	—	—	—	—	—	—	—	—
28	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	—	—
38	—	—	—	—	—	—	—	—	—	—	—	—
42	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	—	—	—	—	—	—
54	—	—	—	—	—	—	—	—	—	—	—	—
57	—	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	—	—	—	—	—	—	—
63.5	—	—	—	—	—	—	—	—	—	—	—	—
68	—	—	—	—	—	—	—	—	—	—	—	—
70	—	—	—	—	—	—	—	—	—	—	—	—
73	—	—	—	—	—	—	—	—	—	—	—	—
76	—	—	—	—	—	—	—	—	—	—	—	—
83	—	—	—	—	—	—	—	—	—	—	—	—
89	—	—	—	—	—	—	—	—	—	—	—	—

95	—	—	—	—	—	—	—	—	—	—	—	—
102	—	—	—	—	—	—	—	—	—	—	—	—
108	—	—	—	—	—	—	—	—	—	—	—	—
114	—	—	—	—	—	—	—	—	—	—	—	—
121	—	—	—	—	—	—	—	—	—	—	—	—
127	—	—	—	—	—	—	—	—	—	—	—	—
133	—	—	—	—	—	—	—	—	—	—	—	—
140	—	—	—	—	—	—	—	—	—	—	—	—
146	—	—	—	—	—	—	—	—	—	—	—	—
152	—	—	—	—	—	—	—	—	—	—	—	—
159	—	—	—	—	—	—	—	—	—	—	—	—
168	121.83	126.27	130.51	136.50	—	—	—	—	—	—	—	—
180	133.07	138.10	142.94	149.82	—	—	—	—	—	—	—	—
194	146.19	151.91	157.44	165.36	—	—	—	—	—	—	—	—
203	154.62	160.78	166.75	175.33	183.47	188.65	—	—	—	—	—	—
219	169.62	176.58	183.33	193.10	202.41	208.38	—	—	—	—	—	—
245	193.99	202.22	210.26	221.95	233.25	240.44	—	—	—	—	—	—
273	220.23	229.85	239.27	253.03	266.40	274.96	—	—	—	—	—	—
299	244.59	255.49	266.20	281.88	297.10	307.02	335.57	353.62	366.64	375.08	395.30	414.29
325	266.96	281.14	293.13	310.73	327.90	339.10	371.49	392.09	407.04	416.75	440.34	462.28
351	298.32	306.79	320.06	339.59	358.68	371.16	407.40	430.59	447.43	458.43	485.24	510.46
377	317.69	332.44	346.99	368.44	389.45	403.22	442.30	469.06	484.82	500.14	529.98	558.55
402	341.10	357.08	372.86	396.16	419.02	434.01	477.81	506.02	526.66	540.17	573.10	604.79
426	363.61	380.77	397.74	422.82	447.46	463.64	510.97	541.57	560.47	578.68	614.56	649.21

Continued

Outside diameter, mm	Thickness of wall, mm											
	(38)	40	(42)	45	(48)	50	56	60	63	(65)	70	75
	Theoretical weight per linear metre, kg											
450	386.08	404.42	422.56	449.43	475.84	493.20	544.10	577.04	601.24	617.12	655.96	693.56
(465)	400.13	419.22	438.11	466.07	493.59	511.70	564.83	599.24	624.54	641.16	681.84	721.31
480	414.19	436.01	453.64	482.72	511.35	530.19	585.53	621.43	632.31	665.20	707.74	749.05
500	432.93	453.74	474.35	504.91	535.02	554.85	613.15	651.02	678.91	697.26	742.27	786.04
530	461.04	483.34	505.42	538.20	570.53	591.84	654.58	695.41	725.52	745.35	794.05	841.52
(550)	479.79	503.06	526.15	560.40	594.21	616.50	682.19	725.00	756.59	777.41	828.58	878.51
560	—	—	—	—	—	—	—	—	—	—	—	—
600	—	—	—	—	—	—	—	—	—	—	—	—
630	—	—	—	—	—	—	—	—	—	—	—	—
710	—	—	—	—	—	—	—	—	—	—	—	—
800	—	—	—	—	—	—	—	—	—	—	—	—

Length of pipe from 4 to 12.5 m.

Curvature of pipe:
for wall thickness up to 20 mm, maximum 1.5 mm per linear metre
for wall thickness from 20 to 30 mm, maximum 2 mm per linear metre
for wall thickness above 30 mm maximum 4 mm per linear metre

SEAMLESS STEEL PIPE, COLD-DRAWN AND COLD-ROLLED

ГОСТ 8734-58

Dimensions

Outside diameter, mm	Thickness of walls, mm																	
	0.10	0.16	0.2	0.25	0.30	0.40	0.50	0.60	0.80	1.0	1.2	1.4	1.5	1.6	1.8	2.0	2.2	2.5
	Theoretical weight per linear metre, kg																	
1.0	0.0022	0.0033	0.0039	0.0046	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.6	0.0037	0.0057	0.0069	0.0083	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.0	0.0047	0.0073	0.0089	0.0108	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.5	0.0059	0.0092	0.0113	0.0139	0.0163	0.0207	—	—	—	—	—	—	—	—	—	—	—	—
3	0.0071	0.0112	0.0138	0.0169	0.0200	0.0256	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	0.0187	0.0231	0.0274	0.0355	0.043	0.050	0.063	0.074	0.083	—	—	—	—	—	—	—
5	—	—	0.0236	0.0292	0.0348	0.0454	0.055	0.065	0.083	0.099	0.112	0.124	0.129	0.134	—	—	—	—
6	—	—	0.0285	0.0354	0.0421	0.055	0.068	0.080	0.103	0.123	0.142	0.159	0.166	0.174	0.186	0.197	—	—
7	—	—	0.0335	0.0416	0.0496	0.065	0.080	0.095	0.122	0.148	0.172	0.193	0.203	0.213	0.230	0.247	0.260	0.277
8	—	—	0.0384	0.0477	0.057	0.075	0.092	0.110	0.142	0.173	0.202	0.227	0.240	0.253	0.275	0.296	0.315	0.339
9	—	—	0.0433	0.054	0.064	0.085	0.105	0.125	0.162	0.197	0.231	0.262	0.277	0.292	0.319	0.345	0.369	0.401
10	—	—	0.0482	0.060	0.072	0.095	0.117	0.139	0.182	0.222	0.261	0.296	0.314	0.332	0.363	0.395	0.423	0.462
11	—	—	0.053	0.066	0.079	0.105	0.129	0.154	0.201	0.247	0.290	0.331	0.351	0.371	0.407	0.444	0.477	0.524
12	—	—	0.058	0.072	0.087	0.115	0.142	0.169	0.221	0.271	0.320	0.365	0.388	0.411	0.452	0.493	0.532	0.586
13	—	—	0.063	0.079	0.094	0.124	0.154	0.184	0.241	0.296	0.349	0.400	0.425	0.451	0.496	0.543	0.585	0.647
14	—	—	0.068	0.085	0.101	0.134	0.166	0.199	0.260	0.321	0.379	0.434	0.462	0.490	0.541	0.592	0.640	0.709

Continued

Outside diameter, mm	Thickness of walls, mm																	
	0.10	0.16	0.2	0.25	0.30	0.40	0.50	0.60	0.80	1.0	1.2	1.4	1.5	1.6	1.8	2.0	2.2	2.5
	Theoretical wight per linear metre, kg																	
(15)	—	—	0.073	0.091	0.109	0.144	0.179	0.214	0.280	0.345	0.409	0.468	0.499	0.529	0.585	0.641	0.694	0.771
16	—	—	0.078	0.097	0.116	0.154	0.191	0.228	0.300	0.370	0.438	0.503	0.536	0.568	0.629	0.691	0.747	0.832
(17)	—	—	0.083	0.103	0.124	0.164	0.203	0.244	0.320	0.395	0.468	0.537	0.573	0.608	0.674	0.740	0.802	0.894
18	—	—	0.088	0.109	0.131	0.174	0.216	0.258	0.340	0.419	0.497	0.572	0.610	0.647	0.717	0.789	0.856	0.956
(19)	—	—	0.093	0.115	0.138	0.183	0.228	0.274	0.359	0.444	0.527	0.606	0.647	0.687	0.762	0.838	0.910	1.02
20	—	—	0.098	0.122	0.146	0.193	0.240	0.288	0.379	0.469	0.556	0.642	0.684	0.726	0.806	0.888	0.965	1.08
(21)	—	—	—	—	—	0.203	0.253	0.303	0.399	0.493	0.586	0.675	0.721	0.767	0.851	0.937	1.02	1.14
22	—	—	—	—	—	0.212	0.265	0.318	0.419	0.518	0.616	0.710	0.758	0.806	0.895	0.986	1.07	1.20
(23)	—	—	—	—	—	0.222	0.277	0.333	0.438	0.543	0.645	0.745	0.795	0.846	0.940	1.04	1.13	1.26
(24)	—	—	—	—	—	0.236	0.290	0.347	0.458	0.567	0.647	0.779	0.832	0.885	0.984	1.09	1.18	1.33
25	—	—	—	—	—	0.242	0.302	0.363	0.478	0.592	0.703	0.813	0.869	0.925	1.03	1.13	1.24	1.39
(27)	—	—	—	—	—	0.262	0.327	0.392	0.516	0.641	0.762	0.882	0.943	1.00	1.12	1.23	1.34	1.51
28	—	—	—	—	—	0.272	0.340	0.406	0.536	0.666	0.792	0.916	0.98	1.04	1.16	1.28	1.40	1.57
30	—	—	—	—	—	0.292	0.364	0.436	0.576	0.715	0.851	0.986	1.05	1.12	1.25	1.38	1.51	1.70
32	—	—	—	—	—	0.311	0.389	0.466	0.615	0.755	0.910	1.053	1.13	1.20	1.34	1.48	1.62	1.76
34	—	—	—	—	—	0.331	0.413	0.496	0.655	0.814	0.968	1.122	1.20	1.28	1.43	1.58	1.72	1.94
(35)	—	—	—	—	—	0.341	0.426	0.510	0.675	0.838	0.993	1.159	1.24	1.32	1.47	1.63	1.78	2.00
36	—	—	—	—	—	0.350	0.438	0.525	0.695	0.863	1.027	1.192	1.28	1.36	1.52	1.68	1.83	2.07
38	—	—	—	—	—	0.370	0.464	0.555	0.734	0.912	1.087	1.26	1.35	1.44	1.61	1.78	1.94	2.19

40	—	—	—	—	—	0.390	0.494	0.585	0.774	0.962	1.146	1.33	1.42	1.52	1.69	1.87	2.05	2.31
42	—	—	—	—	—	—	—	—	—	1.010	1.208	1.41	1.50	1.60	1.79	1.97	2.16	2.44
45	—	—	—	—	—	—	—	—	—	1.090	1.295	1.51	1.61	1.71	1.91	2.12	2.32	2.62
48	—	—	—	—	—	—	—	—	—	1.160	1.382	1.61	1.72	1.83	2.05	2.27	2.48	2.81
50	—	—	—	—	—	—	—	—	—	1.21	1.44	1.68	1.79	1.91	2.14	2.37	2.59	2.93
(51)	—	—	—	—	—	—	—	—	—	1.23	1.47	1.71	1.83	1.96	2.18	2.42	2.64	2.99
53	—	—	—	—	—	—	—	—	—	1.28	1.53	1.78	1.90	2.03	2.27	2.51	2.76	3.11
(54)	—	—	—	—	—	—	—	—	—	1.31	1.59	1.82	1.94	2.07	2.31	2.56	2.81	3.18
56	—	—	—	—	—	—	—	—	—	1.36	1.62	1.89	2.02	2.15	2.40	2.66	2.92	3.30
(57)	—	—	—	—	—	—	—	—	—	1.38	1.65	1.92	2.05	2.18	2.45	2.71	2.97	3.36
60	—	—	—	—	—	—	—	—	—	1.46	1.74	2.02	2.16	2.31	2.58	2.86	3.13	3.55
63	—	—	—	—	—	—	—	—	—	1.53	1.83	2.13	2.27	2.42	2.71	3.01	3.30	3.72
65	—	—	—	—	—	—	—	—	—	1.58	1.89	2.20	2.35	2.50	2.80	3.11	3.40	3.85
(68)	—	—	—	—	—	—	—	—	—	1.65	1.98	2.30	2.46	2.62	2.93	3.26	3.57	4.04
70	—	—	—	—	—	—	—	—	—	1.70	2.03	2.37	2.53	2.70	3.02	3.35	3.68	4.16
(73)	—	—	—	—	—	—	—	—	—	1.78	2.12	2.47	2.64	2.82	3.16	3.50	3.84	4.35
75	—	—	—	—	—	—	—	—	—	1.82	2.18	2.54	2.71	2.90	3.24	3.60	3.95	4.46
(76)	—	—	—	—	—	—	—	—	—	1.85	2.21	2.57	2.76	2.94	3.29	3.65	4.00	4.53
80	—	—	—	—	—	—	—	—	—	—	—	2.71	2.90	3.09	3.47	3.84	4.22	4.77
(83)	—	—	—	—	—	—	—	—	—	—	—	2.82	3.02	3.21	3.60	4.00	4.37	4.96
85	—	—	—	—	—	—	—	—	—	—	—	2.88	3.08	3.29	3.69	4.09	4.48	5.08
(89)	—	—	—	—	—	—	—	—	—	—	—	3.02	3.24	3.45	3.86	4.29	4.70	5.33
90	—	—	—	—	—	—	—	—	—	—	—	3.05	3.27	3.49	3.91	4.34	4.76	5.39
95	—	—	—	—	—	—	—	—	—	—	—	3.21	3.46	3.68	4.13	4.59	5.02	5.70

Continued

Outside diameter, mm	Thickness of walls, mm																	
	0.10	0.16	0.2	0.25	0.30	0.40	0.50	0.60	0.80	1.0	1.2	1.4	1.5	1.6	1.8	2.0	2.2	2.5
	Theoretical weight per linear metre, kg																	
100	—	—	—	—	—	—	—	—	—	—	—	3.40	3.64	3.88	4.35	4.83	5.30	6.00
(102)	—	—	—	—	—	—	—	—	—	—	—	3.46	3.73	3.97	4.45	4.93	5.40	6.13
(108)	—	—	—	—	—	—	—	—	—	—	—	3.67	3.95	4.21	4.72	5.23	5.74	6.50
110	—	—	—	—	—	—	—	—	—	—	—	3.74	4.03	4.28	4.81	5.32	5.84	6.62
120	—	—	—	—	—	—	—	—	—	—	—	—	4.36	4.66	5.25	5.83	6.38	7.24
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.46	6.06	6.64	7.54
130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.86
(133)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8.05
140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
160	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
170	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
180	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
190	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Dimensions in parentheses are not recommended.

Pipe of dimensions beyond the heavy line are supplied on special order. Length of pipe from 1.5 to 9 m Maximum curvature 1.5 mm per linear metre.

Dimensions

Outside diameter, mm	Thickness of walls, mm																		
	2.8	3.0	3.2	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9	9.5	10	11	12
	Theoretical weight per linear metre, kg																		
1.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	0.427	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10	0.496	0.518	0.536	0.561	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11	0.566	0.592	0.615	0.647	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	0.635	0.666	0.694	0.734	0.789	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(13)	0.703	0.740	0.774	0.820	0.888	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14	0.772	0.814	0.852	0.906	0.986	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(15)	0.841	0.888	0.932	0.993	1.09	1.17	1.23	—	—	—	—	—	—	—	—	—	—	—	—
16	0.91	0.962	1.01	1.08	1.18	1.28	1.35	—	—	—	—	—	—	—	—	—	—	—	—
(17)	0.98	1.04	1.09	1.17	1.28	1.39	1.48	—	—	—	—	—	—	—	—	—	—	—	—
18	1.05	1.11	1.17	1.25	1.38	1.50	1.60	—	—	—	—	—	—	—	—	—	—	—	—
(19)	1.12	1.18	1.25	1.34	1.48	1.61	1.73	1.54	1.92	—	—	—	—	—	—	—	—	—	—
20	1.19	1.26	1.33	1.42	1.58	1.72	1.85	1.97	2.07	—	—	—	—	—	—	—	—	—	—

Continued

Outside di-ameter, mm	Thickness of walls, mm																		
	2.8	3.0	3.2	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9	9.5	10	11	12
	Theoretical weight per linear metre, kg																		
(21)	1.26	1.33	1.41	1.51	1.68	1.83	1.97	2.10	2.22	—	—	—	—	—	—	—	—	—	—
22	1.33	1.41	1.49	1.60	1.77	1.94	2.10	2.24	2.37	—	—	—	—	—	—	—	—	—	—
(23)	1.39	1.48	1.57	1.68	1.87	2.05	2.22	2.37	2.52	—	—	—	—	—	—	—	—	—	—
(24)	1.46	1.55	1.64	1.77	1.97	2.16	2.34	2.51	2.66	2.81	2.93	—	—	—	—	—	—	—	—
25	1.53	1.63	1.72	1.86	2.07	2.28	2.47	2.64	2.81	2.97	3.11	—	—	—	—	—	—	—	—
(27)	1.67	1.78	1.88	2.03	2.27	2.50	2.71	2.92	3.11	3.29	3.45	—	—	—	—	—	—	—	—
28	1.74	1.85	1.96	2.11	2.37	2.61	2.84	3.05	3.26	3.45	3.63	—	—	—	—	—	—	—	—
30	1.88	2.00	2.12	2.29	2.56	2.83	3.08	3.32	3.55	3.77	3.97	4.16	4.34	—	—	—	—	—	—
32	2.02	2.15	2.28	2.46	2.76	3.05	3.33	3.59	3.85	4.09	4.32	4.53	4.74	—	—	—	—	—	—
34	2.15	2.29	2.43	2.63	2.96	3.27	3.58	3.87	4.14	4.41	4.66	4.90	5.13	—	—	—	—	—	—
(35)	2.22	2.37	2.51	2.72	3.06	3.38	3.70	4.00	4.29	4.57	4.83	5.09	5.33	—	—	—	—	—	—
36	2.29	2.44	2.59	2.81	3.16	3.50	3.82	4.14	4.44	4.73	5.01	5.27	5.52	—	—	—	—	—	—
38	2.43	2.59	2.75	2.98	3.35	3.72	4.07	4.41	4.74	5.05	5.35	5.64	5.92	6.18	6.44	—	—	—	—
40	2.56	2.74	2.91	3.15	3.55	3.94	4.32	4.68	5.03	5.37	5.70	6.01	6.31	6.60	6.88	—	—	—	—
42	2.70	2.89	3.07	3.32	3.75	4.16	4.56	4.95	5.33	5.69	6.04	6.38	6.71	7.02	7.32	—	—	—	—
45	2.91	3.11	3.31	3.58	4.04	4.49	4.93	5.36	5.77	6.17	6.56	6.94	7.30	7.65	7.99	8.32	8.63	—	—
48	3.11	3.33	3.54	3.84	4.34	4.83	5.30	5.76	6.21	6.65	7.08	7.49	7.89	8.28	8.66	9.02	9.37	—	—
50	3.25	3.48	3.70	4.01	4.54	5.05	5.55	6.04	6.51	6.9	7.42	7.86	8.29	8.70	9.10	9.49	9.86	10.59	11.25
(51)	3.32	3.55	3.79	4.10	4.64	5.16	5.67	6.17	6.66	7.13	7.60	8.05	8.48	8.91	9.32	9.72	10.11	10.85	11.54
53	3.46	3.70	3.94	4.27	4.83	5.38	5.92	6.44	6.95	7.45	7.94	8.42	8.88	9.33	9.77	10.19	10.60	11.39	12.13
(54)	3.53	3.77	4.02	4.36	4.93	5.49	6.04	6.58	7.10	7.61	8.11	8.60	9.08	9.54	9.99	10.43	10.85	11.67	12.43
56	3.66	3.92	4.17	4.53	5.13	5.71	6.29	6.85	7.40	7.93	8.40	8.97	9.47	9.96	10.43	10.90	11.34	12.21	13.02

(57)	3.74	4.00	4.25	4.62	5.23	5.83	6.41	6.99	7.55	8.10	8.63	9.16	9.67	10.17	10.65	11.13	11.59	12.48	13.32
60	3.94	4.22	4.49	4.88	5.52	6.16	6.78	7.39	7.99	8.58	9.15	9.71	10.26	10.80	11.32	11.83	12.33	13.29	14.21
63	4.15	4.44	4.73	5.13	5.81	6.49	7.14	7.77	8.41	9.04	9.57	10.23	10.81	11.40	11.96	12.49	13.05	14.07	15.09
65	4.29	4.59	4.89	5.31	6.02	6.71	7.40	8.07	8.73	9.38	10.01	10.65	11.25	11.84	12.43	13.00	13.56	14.65	15.68
(68)	4.49	4.81	5.12	5.57	6.31	7.05	7.77	8.48	9.17	9.86	10.53	11.19	11.84	12.47	13.10	13.71	14.30	15.46	16.57
70	4.63	4.96	5.28	5.74	6.51	7.27	8.01	8.75	9.47	10.18	10.88	11.56	12.23	12.89	13.54	14.17	14.80	16.01	17.16
(73)	4.84	5.18	5.52	6.00	6.81	7.60	8.38	9.16	9.91	10.66	11.39	12.11	12.82	13.52	14.21	14.88	15.54	16.82	18.05
75	4.97	5.32	5.68	6.17	7.00	7.82	8.62	9.41	10.18	10.96	11.71	12.48	13.17	13.91	14.61	15.30	15.99	17.31	18.65
(76)	5.05	5.40	5.75	6.26	7.10	7.93	8.75	9.56	10.36	11.14	11.91	12.67	13.42	14.15	14.87	15.58	16.28	17.63	18.94
80	5.32	5.69	6.07	6.60	7.49	8.37	9.24	10.07	10.91	11.75	12.59	13.39	14.15	14.96	15.71	16.45	17.22	18.66	20.10
(83)	5.52	5.92	6.31	6.86	7.79	8.71	9.62	10.51	11.39	12.26	13.12	13.96	14.80	15.62	16.42	17.22	18.00	19.53	21.01
85	5.66	6.06	6.46	7.04	7.98	8.93	9.86	10 75	11.65	12.55	13.45	14.31	15.13	16.01	16.85	17.63	18.45	20.01	21.60
(89)	5.94	6.36	6.77	7.38	8.38	9.38	10.36	11.33	12.28	13.22	14.16	15.07	15.98	16.87	17.76	18.63	19.48	21.16	22.79
90	6.01	6.43	6.86	7.47	8.47	9.49	10.47	11.42	12.39	13.35	14.31	15.22	16.11	17.05	17.95	18.79	19.67	21.43	23.08
95	6.36	6.81	7.26	7.90	8.98	10.04	11.10	12.14	13.17	14.19	15.19	16.18	17.16	18.13	19.09	20.03	20.96	22.79	24.56
100	6.70	7.17	7.65	8.32	9.46	10.59	11.71	12.77	13.87	14.95	16.03	17.09	18.09	19.15	20.15	21.15	22.19	24.14	26.04
(102)	6.84	7.32	7.81	8.50	9.67	10.82	11.96	13.09	14.21	15.31	16.40	17.48	18.55	19.60	20.64	21.67	22.69	24.69	26.63
(108)	7.25	7.77	8.29	9.02	10.26	11.49	12.70	13.90	15.09	16.27	17.44	18.59	19.73	20.86	21.97	23.08	24.17	26.31	28.41
110	7.39	7.92	8.43	9.19	10.46	11.70	12.93	14.19	15.40	16.60	17.75	19.00	20.08	21.30	22.50	23.54	24.70	26.85	29.00
120	8.07	8.66	9.22	10.06	11.44	12.93	14.30	15.51	16.89	18.20	19.50	20.85	22.10	23.40	24.70	25.89	27.20	29.57	31.96
125	8.42	9.02	9.61	10.50	11.91	13.37	14.80	16.15	17.55	19.02	20.35	21.73	23.08	24.42	25.75	27.06	28.35	30.92	33.44
130	8.78	9.40	10.00	10.92	12.43	13.92	15.48	16.88	18.35	19.80	21.20	22.70	24.10	25.50	26.90	28.23	29.70	32.27	34.92
(133)	8.98	9.59	10.25	11.18	12.75	14.26	15.75	17.29	18.79	20.28	21.75	23.21	24.66	26.10	27.52	28.93	30.33	33.10	35.81
140	—	10.11	10.79	11.80	13.42	15.05	16.65	18.24	19.83	21.40	22.96	24.51	26.04	27.57	29.08	30.57	32.06	34.99	37.88
150	—	10.85	11.52	12.65	14.39	16.11	17.85	19.55	21.25	23.00	24.68	26.36	28.01	29.66	31.29	32.91	34.52	37.71	40.84
160	—	—	—	13.51	15.38	17.25	19.09	20.90	22.79	24.60	26.41	28.20	29.99	31.76	33.51	35.26	36.99	40.42	43.80
170	—	—	—	14.31	16.31	18.35	20.30	22.25	24.27	26.21	28.14	30 05	31.96	33.85	35.73	37.60	39.46	43.13	46.76
180	—	—	—	15.20	17.30	19.50	21.59	23.67	25.75	27.81	29.87	31.91	33.93	35.95	37.95	39.95	41.92	45.85	49.72
190	—	—	—	—	18.29	20.60	22.80	25.02	27.22	29.41	31.59	33.75	35.90	38.04	40.17	42.28	44.39	48.56	52.67
200	—	—	—	—	19.67	21.65	24.00	26.38	28.70	31.02	33.32	35.60	37.88	40.14	42.39	44.63	46.85	51.27	55.63

ELECTRIC WELDED
ГОСТ

Outside diameter, mm	Thickness								
	0 5	0.75	1	1.25	1.5	1 75	2	2 25	2.5
	Theoretical weight per linear metre, kg								
5	0.055	0.079	0 099	—	—	—	—	—	—
6	0.068	0.097	0 123	—	—	—	—	—	—
6.3	0.072	0.103	0.131	—	—	—	—	—	—
7	0.080	0.116	0.148	—	—	—	—	—	—
8	0.092	0.134	0.173	(0.208)	—	—	—	—	—
9	0.105	0.153	0.197	0.239	—	—	—	—	—
10	0.117	0.171	0.222	0.270	—	—	—	—	—
11	0.129	0.120	0.247	0.301	—	—	—	—	—
12	0.142	0.208	0.271	0.331	(0.388)	—	—	—	—
13	—	0.227	0.296	0.362	0.425	—	—	—	—
14	—	0 245	0.321	0.393	0.462	—	—	—	—
15	—	0.264	0.345	0.424	(0.499)	—	—	—	—
16	—	0.282	0.370	0.455	(0.536)	—	—	—	—
17	—	0.301	0.395	0.486	0.573	—	—	—	—
18	—	0.319	0.419	0.516	(0.610)	(0.701;	(0.789)	—	—
19	—	0.338	0.444	0.547	0.647	0.744	0.838	—	—
20	—	0.356	0.469	0.578	(0.684)	(0.788)	(0.888)	—	—
21	—	—	0.493	0.609	0.721	0.831	0.937	—	—
22	—	—	0.518	0.640	0.758	0,874	0.986	—	—
23	—	—	0.543	0.670	0.795	0.917	1.04	1.15	1.26
24	—	—	0.567	0.701	(0.832)	(0.960)	(1.09)	(1.21)	(1.33)
25	—	—	0.592	0.732	0.869	1.00	1.13	1.26	1.39
26	—	—	0.617	0.763	0.906	1.05	1.18	1.32	1.45
27	—	—	0.641	0.794	0.943	1.09	1.23	1.37	1.51
28	—	—	0.660	0.825	(0.980)	(1.13)	(1.28)	(1.43)	(1.57)
29	—	—	0.691	0.855	1.02	1.18	1.33	1.48	1.63
30	—	—	0.715	0.886	(1.05)	(1.22)	(1.38)	(1.54)	(1.70)
31	—	—	0.740	0.917	1.09	1.26	1.43	1.60	1.76
32	—	—	—	0.948	1.13	1.31	1.48	1.65	1.82
33	—	—	—	9.979	1.17	1.35	1.53	1.71	(1.88)
34	—	—	—	1.01	1.20	1.39	1.58	1.76	1.94
35	—	—	—	1.04	1.24	1.43	1.63	1.82	2.00
36	—	—	—	1.07	1.28	1.48	1.68	1.87	2.07
37	—	—	—	1 10	1.31	1.52	1.73	1.93	2.13

of wall, mm										
2.75	3	3.25	3.5	3.75	4	4.25	4.5	4.75	5	5.5
(at specific weight of steel 7.85)										
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
1.98	2.15	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—

Outside diameter, mm	Thickness								
	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5
	Theoretical weight per linear metre, kg								
38	–	–	–	1.13	1.35	1.56	1.78	1.98	2.19
39	–	–	–	1.16	1.39	1.61	1.82	2.04	2.25
40	–	–	–	–	1.42	1.65	1.87	2.09	(2.31)
41	–	–	–	–	1.46	1.69	1.92	2.15	2.37
42	–	–	–	–	1.50	1.74	1.97	2.21	2.44
43	–	–	–	–	1.54	1.78	2.02	2.26	2.50
44.5	–	–	–	–	1.59	1.85	2.10	2.34	2.59
46	–	–	–	–	1.65	1.91	2.17	2.43	2.68
47	–	–	–	–	1.68	1.95	2.22	2.48	2.74
48	–	–	–	–	1.72	2.00	2.27	2.54	2.81
51	–	–	–	–	1.83	2.13	2.42	2.71	2.99
53	–	–	–	–	1.91	2.21	2.52	2.82	–
54	–	–	–	–	1.94	2.25	2.56	2.87	3.18
57	–	–	–	–	2.05	2.38	2.71	3.04	3.36
60	–	–	–	–	2.16	2.51	2.86	3.20	3.55
63.5	–	–	–	–	2.29	2.66	3.03	3.40	3.76
70	–	–	–	–	2.53	2.95	3.35	3.76	4.16
76	–	–	–	–	2.76	3.20	3.65	4.09	4.53
83	–	–	–	–	–	3.51	4.00	4.48	4.96
89	–	–	–	–	–	–	4.29	4.81	5.33
95	–	–	–	–	–	–	4.59	5.15	5.70
102	–	–	–	–	–	–	4.93	5.53	6.13
108	–	–	–	–	–	–	–	–	–
114	–	–	–	–	–	–	–	–	–
121	–	–	–	–	–	–	–	–	–
127	–	–	–	–	–	–	–	–	–
133	–	–	–	–	–	–	–	–	–
140	–	–	–	–	–	–	–	–	–
152	–	–	–	–	–	–	–	–	–

Length of pipes:

for outside diameter up to 30 mm	2–6 m
for outside diameter 30–70 mm	3–8.5 m
for outside diameter over 70 mm	5–8.5 m

Continued

of wall, mm

(at specific weight of steel 7.85)

2.75	3	3.25	3.5	3.75	4	4.25	4.5	4.75	5	5.5
2.39	2.59	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
2.83	3.07	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
3.27	3.55	3.83	4.10	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
3.68	4.00	4.31	4.62	—	—	—	—	—	—	—
3.88	4.22	4.55	4.88	—	—	—	—	—	—	—
4.12	4.48	4.83	5.18	—	—	—	—	—	—	—
4.56	4.96	5.35	5.74	—	—	—	—	—	—	—
4.97	5.40	5.83	6.26	6.68	7.10	7.51	7.93	—	—	—
5.44	5.92	6.39	6.86	7.33	7.79	8.25	8.71	—	—	—
5.85	6.36	6.87	7.38	7.88	8.38	8.88	9.38	9.87	—	—
6.26	6.81	7.35	7.90	8.44	—	—	—	—	—	—
6.73	7.32	7.91	8.50	9.09	9.67	10.25	10.82	11.39	11.96	—
—	7.77	8.40	9.02	9.64	10.26	—	—	—	—	—
—	8.21	8.88	9.54	10.20	10.85	11.50	12.15	12.80	13.44	—
—	8.73	9.44	10.14	10.84	11.54	12.24	—	—	—	—
—	9.17	9.92	10.66	11.40	12.13	12.87	13.59	14.32	15.04	—
—	—	—	11.18	11.95	12.73	—	14.26	15.02	15.78	—
—	—	—	11.78	12.60	13.42	14.23	15.04	15.84	16.65	18.24
—	—	—	12.82	13.71	14.60	15.49	16.37	17.25	18.13	19.87

STEEL CRACKING PIPE

ГОСТ 550-58

Seamless steel pipe of the following types is supplied for petroleum oil refineries: furnace, heat-exchanger and communication.

Dimensions of Furnace and Heat-Exchanger Pipe

Outside diameter, mm	Thickness of wall, mm																		
	1.5	2.5	3	3.5	5	6	7	8	9	10	11	12	14	16	18	20	22	25
	Maximum length, m																		
19	9	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	9	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38	—	—	9	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	7	—	—	—	—	—	—	—	—	—	—	—
60	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—	—
76	—	—	—	—	12	—	12	—	12	—	—	—	—	—	—	—	—	—
89	—	—	—	—	—	12.1	12.1	12.1	12.1	—	—	—	—	—	—	—	—	—
102	—	—	—	—	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	9.5	—	—	—	—	—
114	—	—	—	—	—	—	12.1	12.1	12.1	12.1	12.1	—	—	—	—	—	—	—

Continued

Outside diameter, mm	Thickness of wall, mm																	
	1.5	2.5	3	3.5	5	6	7	8	9	10	11	12	14	16	18	20	22	25
	Maximum length, m																	
127	—	—	—	—	—	—	12.1	12.1	12.2	12.2	12.2	12.2	12.2	—	—	—	—	—
140	—	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	—
152	—	—	—	—	—	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	—	—	—	—	—
159	—	—	—	—	—	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	—	—	—	—
219	—	—	—	—	—	—	12	12	12	12	12	12	12	10	9	8	7.5	6.7

Out-of-round and variations in wall thickness for furnace and heat-exchanger pipe shall not exceed 0.8 of the tolerance for the outside diameter and wall thickness; local curvature shall not exceed 1.5 mm per linear metre, and the total curvature shall not exceed 8 mm.

Dimensions of communication pipe:

hot-rolled—in accordance with ГОСТ 8732-58
cold-drawn and cold-rolled — in accordance with ГОСТ 8734-58

Pipe shall be made of steel, grades 10, 20, 10Г2 (ГОСТ 1050-52); X5, X5M and X5BФ (ГОСТ 5632-51); 12MX and 12XMФ (ГОСТ 4543-48).

The manganese content in grade X5M steel shall not exceed 0.5%.

Mechanical Properties of Pipe as Delivered

Grade of steel	Tensile strength, kg/mm²	Yield point, kg/mm²	Elongation, δ_5, %	Reduction of area, %	Impact strength, kgm/cm²	Brinell hardness		Condition of steel as delivered
						diameter of impression, mm, minimum	hardness, maximum	
	minimum							
10	36	22	25	50	8	5.1	137	Hot-rolled not annealed
10Г2	48	27	21	50	12	4.3	197	
20	44	26	22	50	8	4.8	156	
10	34	20	26	50	8	5.1	137	Cold-drawn or cold-rolled after annealing
20	42	24	23	50	8	4.8	156	
12MX	42	25	21	45	7	4.8	156	After annealing
X5	40	22	24	50	10	4.6	170	
X5M	40	22	22	50	12	4.6	170	
X5BΦ	40	22	22	50	12	4.6	170	
12XMΦ	45	23	21	50	6	4.6	170	

STEEL TUBING, SMALL DIMENSIONS

ГОСТ 8940-59 and ГОСТ 8941-59

Dimensions

Outside diameter, mm	Thickness of wall, mm								
	0.10	0.16	0.20	0.25	0.3	0.4	0.5	0.6	0.7
	Inside diameter, mm								
0.3	0.1±0.05	—	—	—	—	—	—	—	—
0.4	0.2±0.05	—	—	—	—	—	—	—	—
0.5	0.3±0.05	0.18±0.05	—	—	—	—	—	—	—
0.6	0.4±0.05	0.28±0.05	0.2±0.05	—	—	—	—	—	—
0.8	0.6±0.05	0.48±0.05	0.4±0.05	0.3±0.05	0.2±0.05	—	—	—	—
1.0	0.8	0.68	0.6±0.05	0.5±0.05	0.4±0.05	0.2±0.05	—	—	—
1.2	1.0	0.88	0.8	0.7	0.6±0.05	0.4±0.05	0.2±0.05	—	—
(1.4)	1.2	1.08	1.0	0.9	0.8	0.6±0.05	0.4±0.05	0.2±0.05	—
1.6	1.4	1.28	1.2	1.1	1.0	0.8	0.6±0.05	0.4±0.05	0.2±0.05
(1.8)	1.6	1.48	1.4	1.3	1.2	1.0	0.8	0.6±0.05	0.4±0.05
2.0	1.8	1.68	1.6	1.5	1.4	1.2	1.0	0.8	0.6±0.05
2.5	2.3	2.18	2.1	2.0	1.9	1.7	1.5	1.3	1.1
3.0	2.8	2.68	2.6	2.5	2.4	2.2	2.0	1.8	1.6
(3.5)	3.3	3.18	3.1	3.0	2.9	2.7	2.5	2.3	2.1
4.0	3.8	3.68	3.6	3.5	3.4	3.2	3.0	2.8	2.6

Continued

Outside diameter, mm	Thickness of wall, mm								
	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
	Inside diameter, mm								
0.3	—	—	—	—	—	—	—	—	—
0.4	—	—	—	—	—	—	—	—	—
0.5	—	—	—	—	—	—	—	—	—
0.6	—	—	—	—	—	—	—	—	—
0.8	—	—	—	—	—	—	—	—	—
1.0	—	—	—	—	—	—	—	—	—
1.2	—	—	—	—	—	—	—	—	—
(1.4)	—	—	—	—	—	—	—	—	—
1.6	—	—	—	—	—	—	—	—	—
(1.8)	0.2±0.05	—	—	—	—	—	—	—	—
2.0	0.4±0.05	0.2±0.05	—	—	—	—	—	—	—
2.5	0.9	0.7	0.5±0.05	0.3±0.05	—	—	—	—	—
3.0	1.4	1.2	1.0	0.8	0.6±0.05	0.4±0.05	0.2±0.05	—	—
(3.5)	1.9	1.7	1.5	1.3	1.1	0.9	0.7	0.5±0.05	—
4.0	2.4	2.2	2.0	1.8	1.6	1.4	1.2	1.0	0.8

Length of tubes:

(a) unmeasured lengths at least 300 mm;
(b) unit lengths and multiple unit lengths up to 7 m.

Tubes shall be made of the following grades of steel, depending on the purpose:

(a) chemical composition—grades 1X18H9, 1X18H9T, 2X18H9, 1X13, 2X13 (ГОСТ 5632-51) as well as other grades on mutual agreement;

(b) chemical composition—grades indicated in subpoint 'a'', the mechanical properties to be set by mutual agreement.

Tubes of grade 1X18H9T steel shall have the following mechanical properties as supplied: tensile strength—minimum 52 kg/mm^2; elongation of tenfold specimen—minimum 26%.

Tube channels shall be cleaned by blowing with dry air from both ends under a pressure of 40—50 atmospheres against a white screen until dust, dirt and scale are removed.

At the Purchaser's request pipe shall pass technological testing as well as microstructure inspection.

At the Purchaser's request pipe shall be subjected to a test for air-tightness: when dry air is pumped into pipe held in water there shall be no leakage of air at a pressure of 40—50 atmospheres

ELECTRIC WELDED STEEL PIPE WITH SPIRAL SEAM

ГОСТ 8696-58

Nominal inside diameter	Outside diameter	Thickness of wall, mm						
		4	5	6	7	8	9	10
mm		Theoretical weight per linear metre, kg						
400	426	41.63	51.91	62.15	72.33	82.47	—	—
450	478	46.76	58.33	69.84	81.31	92.73	—	—
500	529	—	64.61	77.39	90.11	102.9	115.4	—
600	630	—	—	92.33	107.5	122.7	137.8	152.9
700	720	—	—	105.7	123.1	140.5	157.8	175.1

Length of pipe from 8 to 18 m
Maximum curvature 1.5 mm per linear metre.

SEAMLESS STAINLESS STEEL PIPE

ГОСТ 5543-50

Dimensions

Cold-drawn pipe *		Cold-rolled pipe	
outside diameter	thickness of wall	outside diameter	thickness of wall
mm			
6—7	1—1.5	76	4.5—8
8—13	1—2	83	4.5—9
14—19	1—2.5	89	4.5—10
20	1—3	96	5—11
21—29	1—4	102	5—12
30—37	1—5	108	5—13
38—56	1.5—5	114	5.5—15
		121	5.5—16
		127	5.5—18
57	1.5—7		
58			
60		133	6—20
63		140	6—22
65		146	6—23
68		152	6—24
70		159	6—25
73		168	7—27
76		180	8—28
83	3—7	194	10—30
89		219	12—30

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* Cold-rolled pipe is included in the cold-drawn group.

In respect to outside diameter pipe up to 56 mm incl. is available at intervals of 1 mm

In respect to thickness of wall pipe is available in the following sizes:

for thickness of wall up to 5 mm . . . . at intervals of 0.25 mm
for thickness above 5 up to 10 mm . . . at intervals of 0.5 mm
for thickness above 10 mm . . . . at intervals of 1.0 mm

Length of pipe 1.5—7 m.

Pipe is supplied in heat-treated condition.

Mechanical Properties of Pipe as Delivered

Grade of steel	Tensile strength, kg/mm²	Elongation, %
	minimum	
1X18H9	56	40
1X18H9T	56	40
1X14H14B2M	55	35
X18H12M2T	54	35
X17	45	17
X27	45	17
X25T	45	17

Pipe of grade 1X18H9T steel shall withstand test for intercrystalline corrosion

Pipe operating under pressure shall withstand test under hydraulic pressure P expressed in kg/cm² according to the following formula:

$$P = \frac{200\, S \times R}{D_B},$$

where:

S — minimum thickness of wall in mm;
R — permissible stress, taken as 40% of tensile strength, in kg/mm²;
D_B — inside diameter of pipe in mm.

CALIBRATED ROUND STEEL
(ASSORTMENT)
ГОСТ 7417-57

Diameter, mm	Permissible deviation, mm				
	Tolerance class				
	2a	3	3a	4	5
3	−0.014	−0.02	−0.04	−0.06	−0.12
from 3.1 to 4.2 incl. at 0.1 mm intervals; 4.4; 4.5; 4.6; 4.8; 4.9; 5; 5.2; 5.3; 5.5; 5.6; 5.8; 6	−0.018	−0.025	−0.048	−0.08	−0.16
6.1; 6.3; 6.5; 6.7; 6.9; 7; 7.1; 7.3; 7.5; 7.8; 8; 8.2; 8.5; 8.8; 9; 9.2; 9.5; 9.8; 10	−0.022	−0.03	−0.058	−0.10	−0.20
10.2; 10.5; 10.8; 11; 11.2; 11.5; 11.8; 12; 12.2; 12.5; 12.8; 13; 13.5; 14; 14.5; 15; 15.5; 16; 16.5; 17; 17.5; 18	−0.027	−0.035	−0.07	−0.12	−0.24
18.5; 19; 19.5; 20; 20.5; 21; 21.5; from 22 to 30 incl. at 1 mm intervals	−0.033	−0.045	−0.084	−0.14	−0.28
from 31 to 42 incl. at 1 mm intervals; 44; 45; 46; 48; 50	—	−0.05	−0.10	−0.17	−0.34
52; 53; 55; 56; 58; 60; 61; 63; 65	—	−0.06	−0.12	−0.20	−0.40
67; 69; 70; 71; 73; 75; 78; 80	—	—	—	−0.20	−0.40
82; 85; 88; 90; 92; 95; 98; 100	—	—	—	−0.23	−0.46

Rods are available in lengths of from 2.5 to 6 m.

CALIBRATED SQUARE STEEL

ГОСТ 8559-57

Side of square, mm	Permissible deviation, mm		
	Tolerance class		
	3a	4	5
3	−0.04	−0.06	−0.12
3.2; 3.6; 4; 4.5; 5; 5.5; 6	−0.048	−0.08	−0.16
6.3; 7; 8; 9; 10	−0.058	−0.10	−0.20
from 11 to 18 incl. at 1 mm intervals	−0.07	−0.12	−0.24
19; 20; 21; 22; 24; 25; 26; 27; 28; 30	−0.084	−0.14	−0.28
32; 34; 36; 38; 40; 41; 42; 45; 46; 48; 50	−0.10	−0.17	−0.34
53; 55; 56; 60; 63; 65	−0.12	−0.20	−0.40
70; 75; 80	—	−0.20	−0.40
85; 90; 95; 100	—	−0.23	−0.46

Rods are available in lengths of from 2.5 to 6 m.

CALIBRATED HEXAGONAL STEEL

ГОСТ 8560-57

Diameter of inscribed circle, mm	Permissible deviation, mm		
	Tolerance class		
	3a	4	5
3	−0.04	−0.06	−0.12
3.2; 4; 4.5; 5; 5.5; 6	−0.048	−0.08	−0.16
6.3; 7; 8; 9; 10	−0.058	−0.10	−0.20
from 11 to 18 at 1 mm intervals	−0.07	−0.12	−0.24
19; 20; 21; 22; 24; 25; 26; 27; 28; 30	−0.084	−0.14	−0.28
32; 34; 36; 38; 40; 41; 42; 45; 46; 48; 50	−0.10	−0.17	−0.34
53; 55; 56; 60; 63; 65	−0.12	−0.20	−0.40
70; 75; 80	—	−0.20	−0.40
85; 90; 95; 100	—	−0.23	−0.46

Rods are available in lengths of from 2.5 to 6 m.

REFERENCE DATA FOR ROUND, SQUARE AND HEXAGONAL STEEL

F—area of section; P—theoretical weight per linear metre.

Diameter of circle, side of square, diameter of inscribed circle of hexagon, mm	Circle		Square		Hexagon	
	F cm^2	P kg	F cm^2	P kg	F cm^2	P kg
5	0.1963	0.154	0.25	0.196	—	—
5.6	0.2463	0.193	—	—	—	—
6	0.2827	0.222	0.36	0.283	—	—
6.3	0.3117	0.245	—	—	—	—
7	0.3848	0.302	0.49	0.385	—	—
8	0.5027	0.395	0.64	0.502	0.5542	0.435
9	0.6359	0.499	0.81	0.636	0.7015	0.551
10	0.7854	0.617	1.00	0.785	0.866	0.680
11	0.9503	0.746	1.21	0.95	1.048	0.823
12	1.131	0.888	1.44	1.13	1.247	0.979
13	1.327	1.04	1.69	1.33	1.463	1.15
14	1.539	1.21	1.96	1.54	1.697	1.33
15	1.767	1.39	2.25	1.77	1.948	1.53
16	2.011	1.58	2.56	2.01	2.217	1.74
17	2.270	1.78	2.98	2.27	2.490	1.96
18	2.545	2.00	3.24	2.54	2.806	2.20
19	2.835	2.23	3.61	2.82	3.126	2.45
20	3.142	2.47	4.00	3.14	3.464	2.72
21	3.464	2.72	4.41	3.46	3.822	3.00
22	3.801	2.98	4.84	3.80	4.191	3.29
24	4.524	3.55	5.76	4.52	4.993	3.92
25	4.909	3.85	6.25	4.91	5.412	4.25
26	5.309	4.17	6.76	5.30	5.847	4.59
28	6.158	4.83	7.84	6.15	6.790	5.33
30	7.069	5.55	9.00	7.06	7.794	6.12
32	8.042	6.31	10.24	8.04	8.868	6.96
34	9.079	7.13	11.56	9.07	10.010	7.86
36	10.18	7.99	12.96	10.17	11.220	8.81
38	11.34	8.90	14.44	11.24	12.510	9.82
40	12.57	9.87	16.00	12.56	13.86	10.88
42	13.85	10.87	17.64	13.85	15.27	11.99
45	15.90	12.48	20.25	15.90	17.54	13.77

Continued

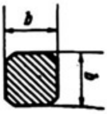
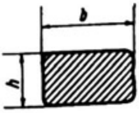
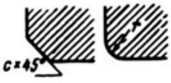
Diameter of circle, side of square, diameter of inscribed circle of hexagon, mm	Circle		Square		Hexagon	
	F cm^2	P kg	F cm^2	P kg	F cm^2	P kg
48	18.10	14.21	23.04	18.09	20.00	15.66
50	19.64	15.42	25.00	19.63	21.64	16.99
53	22.06	17.32	28.09	22.05	24.33	19.10
56	24.63	19.33	31.36	24.61	27.15	21.32
60	28.27	22.19	36.00	28.26	31.18	24.50
63	31.17	24.47	39.69	31.16	34.37	26.98
65	33.18	26.05	42.25	33.17	36.59	28.70
70	38.48	30.21	49.00	38.47	42.43	33.30
75	44.18	34.68	56.25	44.16	48.71	38.24
80	50.27	39.46	64.00	50.24	55.42	43.51
85	56.75	44.55	72.25	56.72	62.57	49.12
90	63.62	49.94	81.00	63.59	70.15	55.07
95	70.88	55.64	90.25	70.85	78.16	61.36
100	78.54	61.65	100.00	78.50	86.6	67.98
105	86.59	67.97	—	—	—	—
110	95.03	74.60	—	—	—	—
120	113.10	88.78	—	—	—	—
125	122.72	96.33	—	—	—	—
130	132.73	104.20	—	—	—	—
140	153.94	120.84	—	—	—	—
150	176.72	138.72	—	—	—	—
160	201.06	157.83	—	—	—	—
170	226.98	178.18	—	—	—	—
180	254.47	199.76	—	—	—	—
190	283.53	222.57	—	—	—	—
200	314.16	246.62	—	—	—	—
210	346.36	271.89	—	—	—	—
220	380.13	298.40	—	—	—	—
240	452.39	355.13	—	—	—	—
250	490.88	385.34	—	—	—	—

CLEAN-DRAWN KEY-STEEL

ГОСТ 8786-58 and 8787-58

Dimensions of Rods

(a) Square and rectangular steel

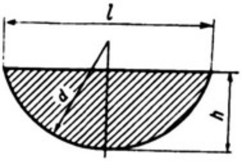
Nominal dimensions of section		c or r	Theoretical weight per linear metre, kg
b	h		
			
mm			
2	2	0.25	0.03
3	3		0.07
4	4		0.13
5	5		0.20
6	6	0.4	0.29
8	7		0.44
10	8		0.63
12	8		0.75
14	9		0.99
16	10	0.6	1.26
18	11		1.55
20	12		1.88
24	14		2.64
28	16	1.0	3.52
32	18		4.52
36	20		5.65
40	22		6.91
45	25		8.79
50	28	1.6	10.99
55	30		12.95
60	32		15.10
70	36		19.78
80	40		25.12
90	45	2.5	31.79
100	50		39.25

The steel used shall have a tensile strength of at least 60 kg/mm².

Maximum deviations in dimensions of cross-section:

width—B_3 (OCT 1023)
height—B_4 (OCT 1024)

(b) Half round steel



Nominal dimensions		l	Theoretical weight per linear metre, kg
h	d		
mm			
1.4	4	3.8	0.031
2.6	7	6.8	0.102
3.7	10	9.7	0.207
5.0	13	12.6	0.369
6.5	16	15.7	0.602
7.5	19	18.6	0.818
9	22	21.6	1.15
10	25	24.5	1.44
11	28	27.3	1.76
13	32	31.4	2.41
15	38	37.1	3.23
16	45	43.1	3.99
17	55	50.8	4.52
19	65	59.1	6.22
24	80	73.3	9.80

The steel used shall have a tensile strength of at least 60 kg/mm^2.
Maximum deviations in dimensions of cross-section:

height—B_4 (OCT 1024)
diameter—B_5 (OCT 1025)

ROUND STEEL OF HIGH FINISH AND CLOSE TOLERANCE

(Silver-Steel)

ГОСТ 2589-44

Diameter	Tolerance class	
	3	4
	Permissible deviation	
mm		
0.2	−0.015	−0.05
0.25		
0.3		
0.35		
0.4		
0.45		
0.5	−0.02	−0.06
0.55		
0.6		
0.65		
0.7		
0.75		
0.8		
0.85		
0.9		
0.95		
1.0		
1.05		
1.1		
1.15		
1.2		
1.25		
1.3		
1.35		
1.4	−0.02	−0.06
1.45		
1.5		
1.55		
1.6		
1.65		
1.7		
1.75		
1.8		
1.85		
1.9		
1.95		
2.0		
2.05		
2.1		
2.15		
2.2		
2.25		
2.3		
2.35		
2.4		
2.45		
2.5		
2.55		
2.6		

Continued

Diameter	Tolerance class		Diameter	Tolerance class	
	3	4		3	4
	Permissible deviation			Permissible deviation	
mm			mm		
2.65	−0.02	−0.06	4.1	−0.025	−0.08
2.7			4.15		
2.75			4.2		
2.8			4.25		
2.85			4.3		
2.9			4.35		
2.95			4.4		
3.0			4.45		
			4.5		
			4.55		
3.05	−0.025	−0.08	4.6		
3.1			4.65		
3.15			4.7		
3.2			4.75		
3.25			4.8		
3.3			4.85		
3.35			4.9		
3.4			4.95		
3.45			5.0		
3.5			5.05		
3.55			5.1		
3.6			5.15		
3.65			5.2		
3.7			5.25		
3.75			5.3		
3.8			5.35		
3.85			5.4		
3.9			5.45		
3.95			5.5		
4.0			5.55		
4.05			5.6		

Continued

Diameter	Tolerance class	
	3	4
	Permissible deviation	
mm		
5.65	−0.025	−0.08
5.7		
5.75		
5.8		
5.85		
5.9		
5.95		
6.0		
6.1	−0.03	−0.10
6.2		
6.3		
6.4		
6.5		
6.6		
6.7		
6.8		
6.9		
7.0		
7.1		
7.2		
7.3		
7.4		
7.5		
7.6		
7.7		
7.8		
7.9		
8.0		
8.1		
8.2		
8.3	−0.03	−0.10
8.4		
8.5		
8.6		
8.7		
8.8		
8.9		
9.0		
9.1		
9.2		
9.3		
9.4		
9.5		
9.6		
9.7		
9.8		
9.9		
10.0		
10.25	−0.035	−0.12
10.5		
10.75		
11.0		
11.25		
11.5		
11.75		
12.0		
12.25		
12.5		
12.75		
13.0		

Continued

Diameter	Tolerance class		Diameter	Tolerance class	
	3	4		3	4
	Permissible deviation			Permissible deviation	
mm			mm		
13.25	−0.035	−0.12	17.5	−0.035	−0.12
13.5			18		
13.75			18.5	−0.045	0.14
14.0			19		
14.25			19.5		
14.5			20		
14.75			21		
15			22		
15.5			23		
16			24		
16.5			25		
17					

Tolerance satisfies OCT 1023 and 1024.

Out-of-round, i.e., the difference between the maximum and minimum diameters at the same cross-section, shall not exceed one-half the permissible deviation in diameter for the corresponding tolerance class.

Rods are available in the following lengths:

for diameters up to 1 mm incl.	from 0.5 to 1 m
for diameters from 1.05 to 3 mm incl. . . .	from 1 to 2 m
for diameters from 3.05 to 9 mm incl. . . .	from 1.5 to 2.5 m
for diameters over 9 mm	from 2 to 4 m

WIRE

ROUND COLD-DRAWN WIRE

ГОСТ 2771-57

Diameter, mm	Permissible deviation, mm						
	Tolerance class						
	1	2	2a	3	3a	4	5
0.005; 0.0056; 0.006; 0.007; 0.008; 0.009	—	−0.001	−0.0015	−0.0020	—	—	—
0.010; 0.011; 0.012; 0.014; 0.016; 0.018; 0.020; 0.022; 0.025; 0.028	−0.001	−0.002	−0.003	−0.004	−0.005	—	—
0.032; 0.036; 0.040; 0.045; 0.050; 0.056; 0.060; 0.063; 0.070; 0.080; 0.090	−0.002	−0.003	−0.005	−0.008	−0.010	—	—
0.10; 0.11; 0.12; 0.14; 0.16; 0.18; 0.20; 0.22; 0.25; 0.28; 0.30	−0.003	−0.005	−0.008	−0.013	−0.020	−0.035	−0.050
0.32; 0.36; 0.40; 0.45; 0.50; 0.56	−0.004	−0.006	−0.010	−0.015	−0.025	−0.040	−0.060
0.63; 0.70; 0.80; 0.90	−0.005	−0.007	−0.012	−0.018	−0.030	−0.045	−0.070
1.0; 1.1; 1.2; 1.4; 1.6; 1.8; 2.0; 2.2; 2.5; 2.8; 3.0	—	−0.010	−0.014	−0.020	−0.040	−0.060	−0.120

Diameter, mm	Permissible deviation, mm						
	Tolerance class						
	1	2	2a	3	3a	4	5
3.2; 3.6; 4.0; 4.5; 5.0; 5.6	—	−0.013	−0.018	−0.025	−0.048	−0.080	−0.16
6.3; 7.0; 8.0; 9.0	—	−0 016	−0.022	−0.030	−0.058	−0.10	−0.20
10; 11; 12; 14; 16	—	—	−0.027	−0.035	−0.070	−0.12	−0.24

LOW CARBON STEEL WIRE, GENERAL PURPOSE

ГОСТ 3282-46

This wire is available in both the heat-treated and untreated condition.

There are two types of surface:

(a) bright (after cold working or heat treatment), and

(b) black (covered with scale after heat treatment).

Assortment

Nominal diameter	Permissible deviation	Nominal diameter	Permissible deviation
mm		mm	
0.16 0.18	−0.02	0.28 0.30	−0.03
0.20 0.22 0.25	−0.03	0.35 0.40 0.45	−0.04

Continued

Nominal diameter	Permissible deviation	Nominal diameter	Permissible deviation
mm		mm	
0.50	−0.04	2.20	−0.12
0.55		2.50	
0.60		2.80	
0.70	−0.08	3.00	
0.80		3.50	−0.16
0.90		4.00	
1.00	−0.12	4.50	
1.10		5.00	
1.20		5.50	
1.40		6.00	
1.60		7.00	−0.20
1.80		8.00	
2.00		9.00	
		10.0	

This wire is made from rods according to ГОСТ 502-41 and ГОСТ 2590-57.

Mechanical Properties

Diameter, mm	Tensile strength, kg/mm², maximum	Diameter, mm	Tensile strength, kg/mm², maximum
0.16—0.45	140	2.80—3.50	100
0.50—1.20	130	4.00—5.00	85
1.40—2.50	120	5.50 and over	70

Wire from 0.8 to 7.0 mm in diameter that has not been heat-treated shall withstand at least four bendings.

Heat-treated wire shall have a tensile strength of 30—50 kg/mm².

LOW CARBON COLD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT

ГОСТ 6727-53

Dimensions

Nominal diameter	Permissible deviation	Nominal diameter	Permissible deviation
mm		mm	
3.0	±0.06	6.0	±0.08
3.5	±0.08	7.0	±0.10
4.0		8.0	
4.5		9.0	
5.0		10.0	
5.5			

This wire is made of the following grades of steel: МСт.0, МСт.1, МСт.2, МСт.3, БСт.0, БСт.3 in accordance with ГОСТ 380-60.

Tensile strength:

diameter 3—5.5 mm	55—85 kg/mm^2
diameter 6—10 mm	45—70 kg/mm^2

Wire 3—7 mm in diameter shall withstand at least 4 bendings.

LOW CARBON STRUCTURAL STEEL WIRE

ГОСТ 1798-49

This wire is made of the following grades of steel. 08 кп, 10, 15 and 20 according to ГОСТ 1050-52.

Dimensions

Diameter	Permissible deviation	Diameter	Permissible deviation
mm		mm	
0.40	−0.04	2.30	−0.06
0.45		2.40	
0.50		2.50	
0.55		2.60	
0.60		2.80	
0.65		3.0	
0.70	−0.045	3.2	−0.08
0.75		3.5	
0.80		3.8	
0.85		4.0	
0.90		4.2	
0.95		4.5	
1.0	−0.06	4.8	
1.1		5.0	
1.2		5.5	
1.3		6.0	
1.4		6.5	−0.1
1.50		7.0	
1.60		7.5	
1.70		8.0	
1.80		8.5	
1.90		9.0	
2.00		9.5	
2.20		10.0	

Mechanical Properties

Diameter, mm	Tensile strength			Number of bends	
	grade of steel			grade of steel	
	08 кп	10, 10 кп	15, 15 кп, 20	08 кп, 10, 10 кп	15, 15 кп, 20
	kg/mm²				
	minimum				
0.40—0.75	50	55	60	—	—
0.80—1.20	45	50	55	6	6
1.30—2.50	45	50	55	6	6
2.60—3.50	40	45	50	6	5
3.80—5.00	40	45	50	5	4
5.50—10.00	35	40	45	5	4

TINNED STEEL BINDING WIRE

ГОСТ 9124-59

Dimensions

Diameter	Permissible deviation	Diameter	Permissible deviation
mm		mm	
0.5	±0.03	1.5	±0.04
0.6		1.6	
0.8		2.0	±0.05
1.0		2.5	
1.2	±0.04	3.0	

This wire is available in two types: nonmagnetic (H) and with the magnetic properties usually found in carbon steel (M)

Mechanical Properties

Type H				
		bending through 180°		
diameter, mm	tensile strength, kg/mm²	diameter of spindle, mm	number of bends, minimum	number of twists
1.0	150	10	14	2
1.2			9	
1.5			7	
1.6			6	
2.0			4	
2.5	145		2	
3.0	140	15		

Type M				
		bending through 180°		
diameter, mm	tensile strength, kg/mm²	diameter of spindle, mm	number of bends, minimum	number of twists
0.5	180	—	—	25
0.6		—	—	
0.8		10	24	
1.0			22	
1.2			16	20
1.5	170		12	15
1.6			11	12
2.0			8	10
2.5			5	8
3.0	160	15	3	5

REED WIRE

ГОСТ 5437-57

Mechanical Properties

Diameter, mm	Tensile strength, kg/mm²	Number of bends	Number of twists
		minimum	
0.80	50—65	32	55
0.90		30	48
1.00		26	45
1.05		25	42
1.10		24	40
1.15		23	39
1.20		22	38
1.25		21	37
1.30		20	36
1.40		19	34
1.50		18	33
1.60		17	32
1.70		16	31
1.80		15	30
1.90		14	29
2.00		13	28
2.10		12	27
2.20		12	26
2.30	45—60	12	25
2.40		11	23
2.50		11	21
2.60		10	20
2.70		10	20
2.80	45—60	10	19
2.90		10	19
3.00		9	19
3.10	40—55	12	21
3.20		11	20
3.30		10	19
3.40		10	19
3.50		10	19
3.60		10	19
3.80		9	18
4.00		9	18
4.20		9	18
4.50		9	15
4.80		8	13
5.00		8	13
5.50		7	—
6.00		7	—
6.50		6	—
7.00		6	—
7.50		5	—
8.00		4	—
8.50		4	—

This wire is made of steel, grades 15 and 10 (ГОСТ 1050-52), and is supplied in bright finish or copper-coated.

HEALD WIRE

ГОСТ 9161-59

Heat-treated tinned wire, consisting of two strands of equal diameter soldered together. Used for making the healds for loom hardness

Dimensions	Permissible deviation
mm	
0.34	±0.01
0.40	
0.50	
0.56	
0.60	
0.80	±0.02

This wire is made of steel, grades 55 and 50 (ГОСТ 1050-52) Heald wire is soldered with tin, grades 01 or 02 (ГОСТ 860-41) The tensile strength of each strand shall be 105—122 kg/mm².

WIRE OF MEDIUM CARBON STRUCTURAL STEEL

ГОСТ 1982-50

Diameter	Permissible deviation	Diameter	Permissible deviation
mm		mm	
0.30	−0.035	1.70	−0.07
0.35	−0.04	1.80	
0.40		1.90	
0.45		2.00	
0.50		2.20	
0.55		2.50	
0.60		2.80	
0.70		3.00	
0.80		3.50	−0.08
0.90		4.00	
1.00	−0.06	4.50	
1.10		5.00	
1.20		5.50	
1.30		6.00	
1.40		7.00	−0.10
1.50			
1.60			

This wire is made of steel, grades 25, 30, 35, 40, 45 and 50 acording to ГОСТ 1050-52.

Tensile Strength of Wire and Number of Bends as Delivered

Diameter, mm	Tensile strength		Number of bends	
	for wire of steel, grades:			
	25, 30, 35	40, 45, 50	25, 30, 35	40, 45, 50
	kg/mm^2			
	minimum			
0.3—0.7	100	110	—	—
0.8—1.0	90	100	6	5
1.1—2.0	80	90	5	4
2.2—5.0	70	80	3	2
5.5—7.0	60	70	2	1

CARD WIRE

ГОСТ 3875-59

Heat-treated wire of round cross-section for manufacture of cards is available in following diameters, mm:—0.20, 0.22, 0.24, 0.26, 0.28, 0.34, 0.38, 0.40, 0.45, 0.50, 0.56, 0.63, 0.70 and 0.80.

Mechanical Properties

Diameter, mm	Tensile strength, kg/mm^2
0.20—0.38	185—210
0.40 and over	175—200

CARBON STEEL SPRING WIRE

ГОСТ 9389-60

Wire for the manufacture of springs twisted cold and hot tempered.

Diameter	Permissible deviation
mm	
0.14	+0.020 −0.015
0.15	
0.16	
0.18	
0.20	
0.22	
0.25	
0.28	
0.30	
0.32	±0.020
0.36	
0.40	
0.45	
0.50	
0.56	
0.60	
0.63	+0.03 −0.02
0.70	
0.75	
0.80	
0.85	
0.90	
1.0	
1.10	±0.03
1.20	
1.30	
1.40	
1.50	
1.60	
1.70	
1.80	
2.00	
2.20	
2.30	
2.50	
2.80	
3.00	
3.20	±0.04
3.40	
3.50	
3.60	
4.00	
4.50	
5.00	
5.60	
6.00	
6.30	± 0.05
7.00	
8.00	

Mechanical Properties

Diameter, mm	Class I			Class II			Class III		
	tensile strength, kg/mm^2	number of bends	number of twists	tensile strength, kg/mm^2	number of bends	number of twists	tensile strength, kg/mm^2	number of bends	number of twists
		minimum			minimum			minimum	
0.14	270—310	—	35	225—270	—	35	175—225	—	35
0.15	270—310	—	34	225—270	—	34	175—225	—	34
0.16	270—310	—	33	225—270	—	33	175—225	—	33
0.18	270—310	—	31	225—270	—	31	175—225	—	31
0.20	270—310	—	30	225—270	—	30	175—225	—	30
0.22	270—310	—	29	225—270	—	29	175—225	—	29
0.25	270—310	—	27	225—270	—	27	175—225	—	27
0.28	270—310	—	26	225—270	—	26	175—225	—	26
0.30	270—310	—	23	225—270	—	23	175—225	—	23
0.32	265—305	—	22	220—265	—	22	170—220	—	22
0.36	265—305	—	22	220—265	—	22	170—220	—	22
0.40	265—305	—	20	220—265	—	21	170—220	—	21
0.45	265—305	—	17	220—265	—	20	170—220	—	20
0.50	265—305	—	16	220—265	—	19	170—220	—	19
0.56	265—305	—	16	220—265	—	19	170—220	—	19
0.60	265—305	—	16	220—265	—	18	170—220	—	18
0.63	260—300	—	16	215—260	—	18	170—215	—	18
0.70	260—300	—	16	215—260	—	18	170—215	—	18
0.75	260—300	—	16	215—260	—	17	170—215	—	17
0.80	260—300	11	16	215—260	12	17	170—215	12	17
0.85	255—290	11	16	210—255	11	17	165—210	11	17
0.90	255—290	10	16	210—255	11	17	165—210	11	17
1.00	250—285	9	16	205—250	10	17	165—210	10	17
1.10	240—275	8	16	195—240	8	17	155—200	9	17
1.20	240—270	7	16	195—240	7	17	155—200	8	17
1.30	230—260	19	16	190—230	18	17	150—190	18	17
1.40	230—260	17	16	190—230	17	17	150—190	17	17
1.50	220—250	15	16	185—220	15	17	145—185	15	17
1.60	220—250	13	16	185—220	13	17	145—185	13	17

Continued

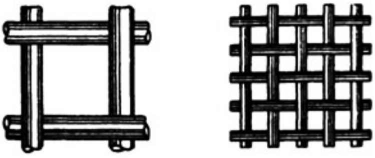
Diameter, mm	Class I			Class II			Class III		
	tensile strength, kg/mm²	number of bends	number of twists	tensile strength, kg/mm²	number of bends	number of twists	tensile strength, kg/mm²	number of bends	number of twists
		minimum			minimum			minimum	
1.70	210—240	11	15	180—210	10	17	140—180	11	17
1.80	210—240	10	15	180—210	10	17	140—180	11	17
2.00	200—230	8	14	180—210	9	16	140—180	10	16
2.20	190—220	7	13	170—200	8	15	140—175	9	15
2.30	190—220	6	13	170—200	7	15	140—175	8	15
2.50	180—205	6	12	165—195	7	15	130—165	8	15
2.80	175—200	7	11	165—195	9	14	130—165	10	14
3.00	170—195	4	10	165—195	5	13	130—165	7	13
3.20	170—195	4	10	155—185	5	13	120—155	7	13
3.40	165—190	3	9	155—180	5	13	120—155	6	13
3.50	165—190	3	8	155—180	5	13	120—155	5	13
3.60	165—190	3	7	155—180	5	13	120—155	5	13
4.00	160—185	4	6	150—175	6	13	115—150	6	13
4.50	150—175	4	6	140—165	5	12	115—145	5	12
5.00	150—175	3	4	140—165	4	9	110—140	4	9
5.60	145—170	5	4	135—160	6	6	105—135	6	6
6.00	145—170	3	2	135—160	6	4	105—135	6	4
6.30	—	—	—	125—145	6	—	100—125	6	—
7.00	—	—	—	125—145	6	—	100—125	6	—
8.00	—	—	—	125—145	5	—	100—125	5	—

STEEL WIRE NETTING

1. STEEL GAUZE FOR MINE SAFETY LAMPS

ГОСТ 7203-54

This gauze of simple weave in square mesh is used in making the safety caps for petrol mine lamps in accordance with ГОСТ 4926-52, suitable for a velocity of a methane-air mixture of up to 6 m/sec.

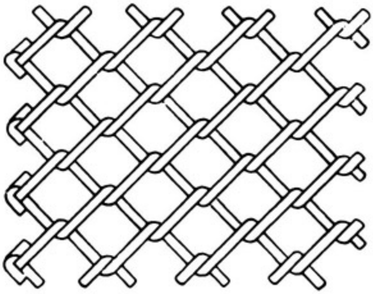


The gauze is made of low carbon, heat-treated steel wire of 0.35 mm diameter according to ГОСТ 3282-46.
Width of gauze 1,000±15 mm. No. of gauze—0.5.

2. WOVEN STEEL NETTING, SINGLE STRAND, IN SQUARE MESH

ГОСТ 5336-50

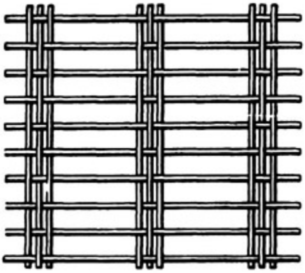
Used for sifting and for confining and protecting purposes. The netting is made of bright finish low carbon steel wire that has not been heat-treated; diameter of wire 0.9—5 mm. Width of netting 1,000, 1,500, 2,000, 3,000 mm



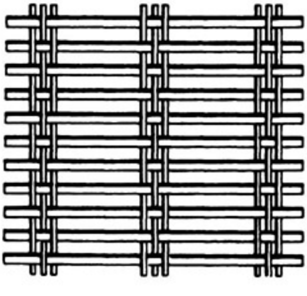
Nos. of netting: 3, 4, 5, 6, 7, 8, 10, 12, 15, 20, 25, 30, 35, 40, 45, 50, 60, 80, 100, corresponding to the nominal dimensions of the side of the mesh.

3. WIRE GAUZE "SEMYANKA"

ГОСТ 3339-46



(a) light—of wire of one diameter 0.4—0.7 mm.



(b) heavy—of wire of different diameter (warp 0.6—0.8 mm, weft 1.2—2 mm).

Used for separating dry bodies according to size and form. The gauze is of simple weave in rectangular mesh; the weft is of single wire, the warp is of three rows of wire.

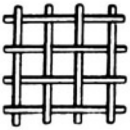
Nos. of gauze: light—20/6, 18/3, 14/3, 12/3, 10/2; heavy—22/2, 18/2, 16/2, 14/2, 12/2, 12/1, 10/1 (the numerator corresponds to the nominal size of the warp, the denominator corresponds to the size of the weft)

The gauze is made of low carbon heat-treated steel in accordance with ГОСТ 3282-46.

Width of gauze 1,000±15 mm.

4. SMOOTH STEEL WIRE GAUZE FOR FLOUR MILLING INDUSTRY

ГОСТ 3924-47



This gauze is used in processing grain and is of simple weave in square mesh, the length of the side being from 5 to 0.4 mm.

Made of low carbon heat-treated (annealed) steel wire.

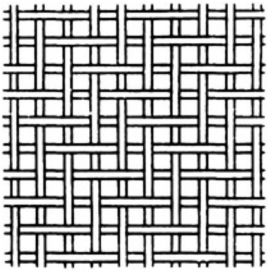
Nos. of gauze: 5—0.4 (5; 4; 3.5; 3.2; 2.8; 2.5; 2.2; 2; 1.8; 1.6; 1.4; 1.2; 1; 0.95; 0.9; 0.85; 0.8; 0.75; 0.67; 0.63; 0.6; 0.56; 0.55; 0.5; 0.45; 0.4).

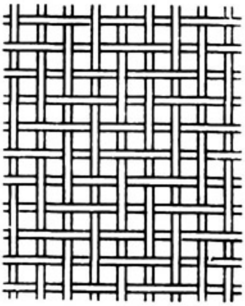
Width of gauze 1,000±15 mm

5. STEEL WIRE GAUZE, TWILL WEAVE IN SQUARE MESH

ГОСТ 4601-49

This gauze is used for separating dry bodies according to particle size, for filtration and other purposes. Wire gauze of twill weave in





square mesh, the length of the side being from 1 to 0.25 mm, is made of low carbon heat-treated steel wire in accordance with 3282-46.

Nos. of gauze. 1; 0.9; 0.8; 0.7; 0.63; 0.56; 0.50; 0.45; 0.4; 0.355; 0.315; 0.28; 0.25.

Diameter of wires:

warp	0.5—0.2
weft	0.55—0.22

Width of gauze 1,000±15 mm.

6. SLOTTED NETTING OF FIRE-GRATE FORM MADE OF WIRE OF TRAPEZOIDAL SECTION

ГОСТ 9074-59

This netting has a smooth, flat working surface and consists of wire bars of trapezoidal section fastened with pins to perpendicular cross-pieces placed at definite intervals

Overall dimensions of netting:

length	from 400 to 5,000 mm
width	from 250 to 2,000 mm

Dimensions of bars:
2.1×0.4×3.5 mm (h)
2.8×0.5×4.5 mm (h)

Nos. of netting (size of slot) 0.10 to 20.

The following metals and alloys are used for making the wire rods of the netting:

brass, grade Л68 (ГОСТ 1019-47),

stainless steel, grades 0X18H9, 1X18H9T and X18H12M3T (ГОСТ 5632-51),

bimetallic wire (steel-copper),

steel 08 кп, 10, 15 and 20 (ГОСТ 1050-52).